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Ms. Marcy Leavitt, Director
New Mexico Environment Department
Water and Waste Management Division
P.O. Box 5469
Santa Fe, New Mexico 87502

Dear Ms. Leavitt:

Re: Smelter/Tailing Soil Investigation Units - Chino AOC
Informal Dispute Resolution Technical Memorandum
Addressing Pre-Feasibility Study Remedial Action Criterion Issues

Chino Mines Company (Chino) appreciated the opportunity to meet with the New Mexico Environment Department (NMED) in Santa Fe on December 13, 2010 regarding informal dispute resolution (DR) initiated under the Smelter/Tailing Soils Investigation Unit under the Chino Administrative Order on Consent (AOC). Informal DR under Article XII(B) of the AOC was invoked in a letter submitted by Chino to Secretary Ron Curry, NMED, on November 15, 2010. Chino initiated informal DR concerning three of the pre-feasibility remedial action criteria (RAC) determinations selected by the NMED in a letter dated September 16, 2010:

Human Health Risk Pre-FS RAC

NMED's selection of a cancer target risk with a Pre-FS RAC for arsenic = 20 mg/kg

Ecological Risk Pre-FS RAC

NMED's selection of a target risk to reduce soil toxicity to plants, Pre-FS RAC = cupric ion activity (pCu^{2+}) ≥ 5 where copper is > 327 mg/kg.

NMED's selection of a target risk for small ground feeding birds with Hazard Quotient = 1, Pre-FS

Attached are written comments and technical arguments to support the issues summarized by Chino at this first informal DR meeting. This submittal meets the commitment Chino made to the NMED in order for its risk assessor and NMED to prepare for the next informal DR meeting scheduled January 12, 2011. In response to Chino's letter invoking dispute resolution and requesting extension of the DR period, the NMED granted an extension to the 20 day informal dispute resolution on November 29, 2010. The period for informal DR will end on January 31, 2011. If the dispute is not resolved by that date, then unless the parties agree to another

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extension, Chino expects to invoke the formal DR process after that date. Chino reserves the right to present additional arguments and documentation if this matter goes to formal DR.

Please contact Mr. Ned Hall at (520) 229-6470 if you have any questions regarding this submittal.

Sincerely,

Kristin Cook for

Timothy E. Eastep, Manager
Environment, Land and Water

TEE:pp
20101229-002

c: Mary Ann Menetrey, NMED
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Freeport-McMoRan Chino Mines Company Response to New Mexico Environment Department's September 19, 2010 Pre Feasibility Study Remedial Action Criteria (Pre-FS RAC) for the Smelter and Tailing Soils Investigation Unit (STSIU)

This document provides a summary of Freeport-McMoRan Chino Mines Company's (Chino) position with respect to New Mexico Environment Department (NMED) Pre FS RAC contained in a letter dated September 19, 2010 for the Smelter and Tailing Soils Investigation Unit (STSIU), which was requested by NMED in our meeting on Monday, December 13, 2010. While this position paper summarizes Chino's position, it does not contain all of the technical and scientific information underlying its position. We look forward to discussing the details of these issues in future meetings with NMED.

Human Health Risk Pre-FS RAC

ARSENIC

NMED Pre FS RAC: NMED selected the cancer target risk with a Pre-FS RAC = 20 mg/kg. This value is supported by the probability analysis and is consistent with a range of arsenic cleanup levels previously set in New Mexico by the United States Environmental Protection Agency.

Chino believes that the Pre-FS RAC proposed by NMED for arsenic is flawed for a number of reasons. First, in setting the proposed RAC for arsenic at 20 mg/kg, NMED relied solely on inapplicable precedents and, accordingly, there is no technical or scientific basis for the level chosen by NMED. Second, the Pre-FS RAC is based on unrealistic exposure assumptions based on implausible residential use scenarios, contrary to federal NCP guidance. Finally, the choice of 20 mg/kg is inconsistent with the probabilistic risk model proposed by Chino, which NMED disregarded without technical explanation and which NMED used for other constituents at the site, such as iron. Chino believes that NMED should reevaluate this Pre-FS RAC based on technical discussions with Chino representatives as part of the informal dispute resolution process.

1. The 20 mg/kg RAC is based on inapplicable precedents and lacks a scientific basis.

According to NMED, the 20 mg/kg value set as the Pre-FS RAC for arsenic was based upon a time critical removal action by the USEPA in 1998 for the Stephenson-Bennett site in New Mexico. There is no publically available information supporting the technical approach used to derive this value, nor did NMED indicate any other technical basis for this level in its responses to Chino's inquiry on the subject. The available information provided by NMED to Chino from ATSDR for the Stephenson-Bennett site indicates that ATSDR was not wedded to 20 mg/kg as a presumptive cleanup level when they stated, "a higher action level may be justifiable depending on (1) the frequency, length, and extent of exposure and (2) the bioavailability of arsenic from soil..."

Moreover, agency experts recently reasserted that the Stephenson-Bennett arsenic cleanup level should not be a presumptive standard for arsenic. In an October 5, 2010 email from Warren Zehner of EPA Region 6, indicated that while 20 mg/kg was a "generally accepted As cleanup standard" at the time of the Stephenson-Bennett cleanup action, subsequent developments call for a more nuanced approach to setting cleanup levels for arsenic.

"EPA and other regulatory agencies have begun to take a more site specific approach to

calculating cleanup levels for As and several other heavy metal contaminants. This change was mainly due to increase knowledge in the fields of bio-uptake and exposure (risk) evaluation. As a result of this new process, I have seen cleanup levels below 20 ppm and as high as 50 ppm, based on the site specific characteristics of the As (bioavailability, specific form, particle size, etc).

Mr. Zehner's response suggests that 20 mg/kg is no longer being used based upon increased knowledge in the areas of toxicity and exposure for human health. At minimum, this suggests that merely relying on Stephenson-Bennett as an example to set a presumptive cleanup level, as NMED did, is not technically justified.

2. The Pre-FS RAC for arsenic is based on implausible residential use assumptions.

During discussions on the pre-FS RAC in 2009, NMED emphasized that the Department's policy is to make the most conservative exposure assumptions even if they are improbable. Whatever the basis for this policy as a general matter, its application to the STSIU goes far beyond reasonable conservatism due to the physical characteristics of land comprising the STSIU, land ownership, and adjacent industrial operations, further described below.

The risk of an overly conservative approach to cleanup based on unrealistic exposure scenarios has been recognized as a legitimate one by EPA. The federal NCP Preamble says that "the assumption of future residential land use may not be justifiable if the probability that a site will support residential use in the future is small" and when exposures based on reasonable future land use are used to estimate risk, the documentation "should include a qualitative assessment of the likelihood that the assumed future land use will occur" (55 FR 8710).

NMED itself has implemented the approach described in the NCP at Los Alamos National Laboratory (LANL). NMED's response to public comments on the proposed Class 3 Permit Modification for Remedy Selection at SWMU 16-021(c) included a question from three environmental advocacy groups about the Department's use of an industrial land use scenario in the human health risk assessment. The advocacy groups demanded that NMED take a "precautionary approach" to the proposed remedy and require cleanup to a subsistence farmer exposure scenario. NMED responded that

Residential land use (including farming) is not always the most plausible or appropriate land use alternative" and "*LANL is an active facility with no near-term intentions of closing, it is unlikely that the canyon bottom areas would be used for industrial or residential uses. The most plausible land use scenario is recreational. However, an industrial land use scenario is more conservative than a recreational scenario and was evaluated and deemed an appropriate land use...In addition,, remediation to industrial levels is consistent with EPA guidance.*

The department has not presented a qualitative assessment of the likelihood that the assumed future land use of residential will occur within the STSIU. A reasonable assessment would consider at least the factors NMED considered with respect to LANL, and if applied at Chino, would produce a similar conclusion due to the following considerations:

- lack of historic agricultural use of this property;
- unsuitable soils and other physical attributes that would make this area nonconducive to residential development (particularly in comparison to other nearby areas that would be more suitable);

- lack of evidence of any near or long-term large population increase and subsequent demand for residential development in this area,
- adjacent mining and industrial uses and regulation of this area with respect to site closure,
- current and foreseeable future ownership of the tailing ponds and surrounding property, and
- the willingness of the current owner to establish institutional controls.

3. Chino proposed a more reasonable approach to calculating a RAC for arsenic, which NMED rejected without technical basis.

Chino proposed an alternative method of deriving a risk-based concentration. USEPA's *Risk Assessment Guidance for Superfund: Part E, Probabilistic Guidance* (2001) provides guidance on probabilistic methods for determining risk and cleanup levels. Based upon EPA's guidance and the approved Human Health Risk Assessment (HHRA) (Gradient, 2008), a probabilistic cleanup level for arsenic is 27 mg/kg. Gradient reviewed the proposed approach and did not have substantive comments that would result in a revision of the value. Chino has previously provided a table with residential cleanup levels for arsenic ranging up to 400 mg/kg as a basis for precedence with respect to residential cleanup scenarios, clearly supporting Mr. Zehner's statements that more nuanced approaches to setting cleanup levels for arsenic are more recently practiced by state and federal agencies. Within the context of this precendence, the 27 mg/kg level calculated by Chino yields a reasonable result. In fact, in Silver City, USEPA issued a cleanup level of 30 mg/kg for arsenic at the Cleveland Mill, demonstrating that higher levels than 20 mg/kg have been used by USEPA for sites within New Mexico. Chino has provided a technically sound approach for establishing a Pre-FS RAC for arsenic, yielded a criteria that is, in fact, lower than ones used by EPA at other sites in New Mexico, and which NMED has rejected for reasons that appear to have no technical basis. Moreover, NMED's rejection of this approach for arsenic is also inconsistent with its acceptance of that approach for iron. NMED set a Pre-FS RAC for iron based entirely on the probabilistic model, suggesting that that NMED has no objection, in principle, to this kind of model.

The Pre-FS RAC of 20 mg/kg for arsenic does not appear to be technically supported. In contrast, the 27 mg/kg was derived in a sound technical manner without substantive objection or criticism from either NMED or its subject matter expert, Gradient. Accordingly, Chino requests NMED reconsider this Pre-FS RAC for the STSIU.

Ecological Risk Pre-FS RAC

NMED Pre-FS RAC: Target Risk to reduce soil toxicity to plants, Pre-FS RAC = cupric ion activity (pCu^{2+}) > 5 where copper is >327 mg/kg. The effects of pH mitigation due to the "white rain" event of 2008 are being monitored and the results may be incorporated into the Feasibility Study and Record of Decision.

As set forth in more detail below, Chino believes that the Pre-FS RAC for cupric ion activity is not scientifically justified and is not consistent with applicable CERCLA guidance. The scientific information contained in the Sitewide Ecological Risk Assessment (ERA) provides no basis for NMED to regulate wildlife risk based upon habitat quality. Moreover, the ERA expressly disavows the appropriateness of the DEL (*de minimus* effects level) and PEL (probable effect level) for cupric ion activity as a remedial standard. NMED's own technical expert observed that the areas at the site with elevated copper and reduced pH were indistinguishable from areas with background levels, and that there was no evidence of any causal relationship between elevated copper/reduced pH and

impacts on plant life at Chino. Finally, the numerous inconsistencies and technical deficiencies contained in the ERA studies, which Chino has consistently pointed out, provide no clear point of departure for assessing cleanup due to decreased habitat for wildlife, especially including birds. In light of these issues, there is no scientific basis to use such cupric ion activity as a RAC for the site. Chino's position on these issues is set forth in more detail below.

Chino is particularly concerned about this issue in light of the language contained in Section 2.8 in the Consent Order, which suggests that a technical infeasibility demonstration cannot be proposed if contamination is greater than 200% of the RAC. It is unclear how this criteria would be assessed in the case of pCu. Moreover, however the Consent Order is interpreted, setting a RAC for cupric ion activity is problematic because there may well be no net environmental benefit to remediating those areas, especially in light of the observations made by NMED's own expert (discussed below) that areas of elevated cupric ion activity are indistinguishable from non-impacted areas, and would unquestionably be damaged by remediation intended to meet the proposed RAC.

1. There is no scientific justification for use of pCu as a RAC.

Chino has consistently pointed out technical concerns related to the PEL, which demonstrate that the PEL does not provide a justifiable point of departure for assessing cleanup. While NMED addressed Chino's numerous comments with statements of uncertainty in the ERA, acknowledging uncertainty does not address the fundamental technical problems with the approach. Chino's technical comments on these issues are summarized in Attachment A, and we believe that these issues can be addressed constructively in the context of informal dispute resolution.

2. The proposed RAC is inconsistent with CERCLA guidance.

The assessment endpoint related to upland vegetation indicates that the ecological relevance and relevance to management goals both hinge upon the hypothesis that metals toxicity to vegetation can alter the plant community structure and function, which can result in decreased wildlife habitat and range quality. The final Sitewide ERA correctly points out

> *"another uncertainty is the extent to which vegetation communities can be affected without compromising wildlife habitat quality in an ecologically meaningful manner. Potential adverse effects of degraded vegetation on wildlife populations depends on the degree of degradation and the area over which effects are observed* (page ES-5).

In the end, however, the Sitewide ERA does not provide answers to these uncertainties which are critical with respect to how the site is regulated under CERCLA. An actual assessment of the number of acres associated with decreased habitat, the criteria associated with the number of impacted acres and their effect on wildlife risk, and actual impact on wildlife risk, such as regional populations of small ground feeding birds are critical to determine the applicability of a scientific metric to actual regulation (as discussed on page 6 of EPA (1999), "*sufficient information should be collected...to allow the risk assessor to make a reasoned decision about...whether the observed or predicted adverse effect on the site's local population or community is of sufficient magnitude, severity, aerial extent, and duration that they will not be able to recover and/or maintain themselves in a healthy state.*"). The point is compounded by shifts in geochemistry due to white rain, further discussed below.

Chino has consistently identified the many technical limitations related to the laboratory phytoxicity tests that the ERA relied on to derive a DEL and PEL for plants at the Chino site. First, the microscale

patchiness of pCu may not be affecting the vegetation consistently across wider areas, a critical point with respect to habitat quality affecting actual risk to wildlife including birds. The phytotoxicity results reveal that while seeds germinate, plants tend to be smaller but smaller plants in areas of patchy pH/pCu may not affect birds whatsoever. Importantly, the Final Sitewide ERA recognizes that this microscale variability means that "PELs and DELs should not be used as remediation goals (page 2-22)," a result that is consistent with the literature on this subject (Sauve et al. 1998). The pre-FS RAC, however, was taken directly from the probable effect level (PEL) derived in the ERA.

3. NMED's own expert observed no apparent environmental impact from elevated pCu.

When Dr. Redente, NMED's technical expert, visited the property in 2004, he evaluated the wildlife habitat value of the plant communities in the general area of elevated cupric ion activity and concluded that the habitat value of such areas was no different than the surrounding areas that were not impacted by the release of contaminants (Redente 2004, see Attachment B). Indeed, Dr. Redente concluded that functional characteristics of the plant communities that occur in areas of elevated metals and reduced pH are indistinguishable from areas with background levels of soil pH and metal concentrations. The structural and functional characteristics (e.g., productivity, species composition, species diversity) of the plant communities in this area are typical of what he finds on native rangeland in the southwestern U.S. He further found that the studies to date have not addressed cause and effect relationships that would explain any potential reductions in plant productivity and diversity at Chino. Consequently, there is no basis for NMED to find that releases of hazardous substances in the STSIU pose a substantial risk to plants that would warrant setting a RAC for their protection.

4. The White Rain event means that setting a RAC for pCu is premature.

A critical component of the pCu metric is pH, which is currently changing based upon the accelerated natural attenuation of low-pH conditions associated with the "white rain" event of 2008. As a result, the nature and extent of contamination has fundamentally changed since the Remedial Investigation and Ecological Risk Assessments were finalized (SRK, 2008, Newfields, 2005, 2008) which complicates the application of cleanup criteria to the STSIU. Specifically, the ERA defined the assessment and measurement endpoints for upland to include the "proportion of area affected" (see Table 1.1-1). Since the effects of the white rain continue to be monitored, it would be premature to undertake further studies in an FS because there may only be a few hundred acres ultimately at issue, making it unclear whether there is an actual risk issue for wildlife arising from the lack of habitat due to plant toxicity. This situation is unprecedented within the body of case studies available for CERCLA sites and associated records of decision. Given that it would be premature to undertake additional studies, it is premature for NMED to set a pre-FS RAC for plants; however, monitoring for permanence associated with the geochemistry post-white rain should continue at NMED's direction.

In summary, Chino believes that the Pre-FS RAC for cupric ion activity is not appropriate and is not consistent with applicable CERCLA guidance, largely because the scientific information contained in the Sitewide ERA provides no current basis for NMED to regulate wildlife risk based upon habitat quality. The numerous inconsistencies and technical deficiencies contained in the ERA studies, which Chino has consistently pointed out, provide no clear point of departure for assessing cleanup due to decreased habitat for wildlife including birds. Moreover, the white rain event further exasperates the situation and, therefore, it is premature for NMED to set a pre-FS RAC for plants.

NMED Pre-FS RAC: Target Risk for small ground feeding birds with Hazard Quotient = 1, Pre-FS RAC = 626 mg/kg copper (LOAEL w/25% soil bioavailability). As stated previously, the Pre-FS

RAC is based on Figure 3, which lists a range of Risk Based Concentrations in soil based on diet percentages of small ground feeding birds.

While Formation Environmental (2010) developed post-BERA RBCs based upon comments from a number of stakeholders, including Chino, Chino continues to believe that there are technical problems related to the RBCs that undermine the technical basis for the Pre-FS RAC for small ground feeding birds, including the following:

1. Representative Receptor Species. Chino previously commented on the need for consistency on the administrative record for the representative receptor, which was originally evaluated as a seed-eating dark eyed junco. In addition, Chino commented on some of the exposure input parameters used for the dark-eyed junco because surrogate species should be modeled "true" to that species' physical characteristics, consistent with USEPA guidance (Chino 2009).

The RBC memo argues that the use of input parameters that are inconsistent with the junco is *appropriate* because the assessment endpoints are not species-specific. This is contrary to applicable technical guidance. Although assessment endpoints are not species-specific, the measurement endpoints used to achieve the assessment endpoints must be measurable environmental characteristics and as such must rely on species-specific variables (USEPA 1997). Since the AOC explicitly describes the protection of a small ground feeding bird (SGFB) as represented by the dark-eyed junco receptor, Chino reasserts that surrogate species should be modeled "true" to that species' physical characteristics, again consistent with USEPA guidance. Formation Environmental (2010) evaluates a junco with a body weight of one species, ingestion rates of another, diet characteristics of a third species and foraging behavior of yet another to formulate a generic bird. Chino is aware of no scientific basis supporting such an approach.

In addition, Formation Environmental (2010) proposed that an insect eating bird is more appropriate as the basis of a Pre-FS RAC than a seed-eating bird. This statement is directly contrary to the conclusions set forth in the approved Site-wide Ecological Risk Assessment (Newfields 2005). The RBC memorandum relies upon a bird that has more insect ingestion than seed ingestion. Insect ingestion has gone from 0 percent in the proposed pre-FS RAC in April 2009 to 60 or 70 percent in the recent Formation Technical Memorandum to derive a cleanup level for copper, a substantial change that is inconsistent with the Sitewide ERA and which substantially alters the calculated RAC. Accordingly, Chino continues to believe that NMED should ensure that any Pre-FS RAC for copper be consistent with the findings set forth in documents contained in the administrative record, such as the Sitewide ERA, and accordingly derive a Pre-FS RAC consistent with the junco, an ecologically relevant endpoint for the STSIU.

2. Estimation of Copper Concentrations in Food Items. Chino also previously commented that bioaccumulation factors (BAFs) should be represented by a regression line, instead of a numeric constant, to reflect the dynamic relationship between copper in soil to that of plants and insects (Chino 2009). Regression-based BAFs provide more certain and appropriate bases to estimate biota concentrations from soil concentrations and should therefore be used in the development of remedial action criteria (RAC). NMED acknowledged in the RBC memorandum that the regression analysis of BAFs recommended by Chino (2009) provides the most reliable tool for the estimation of tissue concentrations, and accordingly made use of those regression-based BAFs to determine RBCs. Chino agrees with NMED's decision to do so and believes this is the correct approach.

Chino also agrees with the conclusions summarized on page 20 of the RBC Memorandum, which indicate

that there may be uncertainty associated with the insect data which are empirical input to the regression-based BAFs. Specifically, Chino notes the following:

- Insects were collected in 1999 from STSIU and 2007 from HWCIU. They were unwashed. USEPA guidance (USEPA 2004) explains that it is critical for BAFs to be based on soil-free tissue concentrations. Determining BAFs based on a mixture of soil and tissue sample misrepresents invertebrate uptake of metals and can result in artificially high BAFs. (The wildlife dose equation already accounts for exposure to Cu through soil ingestion but this is done separately from exposure through food ingestion.)

- The insects were collected before the white rain event. The two historic smelter stacks have since been shut down and demolished. The smelter stacks historically emitted acid-generating (thus pH-lowering) emissions and trace Cu concentrations; in the 1970s, in compliance with new Clean Air Act amendments, the stacks were permitted and controls were implemented to reduce emissions. A significant shift in pH upward was observed at STSIU following the "white rain" precipitation event. During the event a milky alkaline rain containing calcium was deposited on the mine site. The change in pH due to the white rain event may have lowered cupric ion activity of the soil and, hence, bioavailability to plants and invertebrates may also be reduced. The uptake pathway from soil to insects or plant to insects may have been significantly curtailed by the change in soil geochemistry from the white rain event. Accordingly, updated site-specific data should be used in calculating the RAC.

- The risk algorithms account for incidental ingestion of soil as well as food sources. If soil adheres to unwashed insects, then the risk assessment algorithms double-count the intake, because the incidental ingestion component of the algorithm accounts for a dose of metal and the biota concentration itself accounts for a dose of the metal (or alternatively a bioaccumulation factor (BAF) applied to soil to generate a metal dose from biota). The risk assessment acknowledged that this was a source of uncertainty. Since the SSLs in the approved ERA were focused on a 100 percent seed eating bird, however, this uncertainty had no impact on potential cleanup levels until Formation changed its approach in 2010.

- The Formation Technical Memorandum used a regression to back-calculate a cleanup level for copper. The regressions predict insect body burden from soil concentrations. With metals concentration data based upon unwashed insects, however, the correlations are biased because the soil adhered to the exoskeleton of an insect (or present in the gut from ingestion) could significantly increase the metal concentration associated with the insect's tissue, its body burden, and ultimately, the ability for a mathematical model to predict accurate tissue concentrations based upon those data. The mathematical model directly impacts the calculation of the cleanup level.

As such, Chino proposed to conduct another study to address these data gaps and sources of uncertainty. Chino provided a draft work plan entitled, "*Sampling and Analysis Plan for a Terrestrial Invertebrate Copper Bioaccumulation and Bioavailability Study*" to NMED on August 17, 2010. NMED issued comments on the plan dated August 23, 2010 and a revised work plan was submitted on August 30, 2010, which NMED subsequently approved. The sampling event occurred during the week of September 6 and NMED was present. Since that time, laboratory results have been received and the results indicate less copper associated with insect tissue. The results and evaluation are included as Attachment C, and Chino believes that this new data should be incorporated into calculating a revised Pre-FS RAC for copper.

3. Adhering Soil Materials. As noted above, soil associated with insect tissues could result in double counting of the soil ingestion rates (SIR). This issue was addressed in the RBC memorandum by halving the assumed 10% SIR in the dose equation, assuming that ½ the ingested soil was due to direct ingestion

and the other ½ was accounted for in the insect data, which contained some unknown proportion of soil associated with the tissue samples. This assumption does not appear to have any scientific foundation. It is not known how much the soil mass associated with the insect data measured in 1999 contributed to the total copper values, nor how much soil mass associated with the insects constitutes the total SIR of birds.

In effect, the RBC calculation continues to rely on an assumed 10% SIR, a percentage that is based on the ingestion rate for a woodcock (Beyer et al. 1986 as cited by NewFields 2005). The woodcock is a small shore bird that forages for sediment-dwelling invertebrates by sticking its long bill deep into sediments. This is not representative of either the diet or the feeding strategy of SGFBs. A SIR should be based on the diet composition and gathering strategy for the species in question (a terrestrial omnivore). A 2% SIR is more appropriate to use for terrestrial omnivorous or insectivorous birds representative of species potentially at the Site.

4. Bioavailability of Copper. A total copper concentration was measured in the insect samples by analysis via standard CLP protocol that involves a nitric acid digestion. The nitric acid acts to dissolve much of the biotic and abiotic matrix associated with the copper, thus "releasing" the copper from its solid matrix into a dissolved form that can be subsequently analyzed. However, the digestion process in a bird gizzard may result in the release of a smaller fraction of copper. In particular, the higher pH of the bird gizzard (about 2 s.u. higher than CLP digestion protocol) may result in a smaller amount of copper "released" from the matrix for absorption, i.e., the bioavailable fraction of copper. Accordingly, more copper may have been released via the analytical protocol than what is actually released in the bird stomach. This issue is now quite significant, because these data are being used to derive the proposed cleanup level.

The RBC memorandum correctly recognized that predictions of toxicity based solely on total concentrations in various environmental media, without consideration of the bioavailaibility of that media, introduces uncertainty in organism exposure estimates. Because site-specific data regarding the bioavailability of copper to birds was not available, RBCs were calculated assuming a 25% bioavailable fraction of copper in soil and a 100% bioavailable fraction in tissues (as noted at page 15: "No adjustment to the relative bioavailability from food has been made"). This approach is contrary to the conclusion in the approved *Site-wide Ecological Risk Assessment* (page 3.23, Figure 3.6-7) (Newfields, 2005), which recognized that a large fraction of copper is estimated to be consumed through insect ingestion, and that accordingly therefore, tissue bioavailability may play a key role in determining insectivore exposure. Chino addressed this issue in the approved work plan entitled, "*Sampling and Analysis Plan for a Terrestrial Invertebrate Copper Bioaccumulation and Bioavailability Study*" includes a determination of the bioavailability of copper contained in the tissues of insects to birds that may ingest the insects at STSIU. Since that time, laboratory results have been received and are included as Attachment C, and Chino believes that this new data should be incorporated into calculating a revised Pre-FS RAC for copper.

5. RBC Calculation. The ecological relevance of the bird species is important due to habitat and prey items. The RBC memorandum acknowledges this issue in a point made on page 20, "comparison of the RAC to area-weighted averages based on habitats and the types of species likely to be present in the habitats at Chino." The use of a 12 g omnivore that eats 60-70% insects as a receptor to represent the types of species in the STSIU, as Formation did in the RBC memorandum, is not justified because a year-round bird that is that small ($\leq$ 12 g) and is an insectivore is rare on the site and not typical, although some such birds may be found during the breeding season. Most of the ephemeral drainages lack water during the breeding season and do not support hydrophytic trees or shrubs that are important to many small, insectivorous birds. The gray flycatcher, a small insectivore cited as an example of a resident bird,

is not a year-round resident but rather is a summer resident only, as shown in Attachment A of the RBC memorandum. Moreover, according to the Birds of North America online, this species' range is either off or barely on the northern edge of the Chino site and never occurs in the site during the winter. The other small birds (≤ 14 g) given as examples in Table 2 in the letter are granivores, not insectivores.

The flying insects eaten by omnivores and insectivores are less likely to uptake copper due to their proximity to plants and surface soil. Also, the species of birds that frequent drainages may forage on aquatic insects. Because the types of insects that were collected at STSIU in 1999 include mostly larger beetles and grasshoppers, not the classes of insects typically consumed by small invertivores which includes gnats, bees, ants, and other smaller insects, this issue needed further analysis The approved work plan entitled "*Sampling and Analysis Plan for a Terrestrial Invertebrate Copper Bioaccumulation and Bioavailability Study*" provides a sampling protocol to capture the smaller insects, although the practical application of this protocol in the field will be challenging due to difficulty in obtaining adequate sample volume of these small insects to quantify copper and other measurements such as moisture content.

Chino appreciates NMED's consideration of the technical issues outlined in this position paper. While this paper presents Chino's views in a straightforward manner, it should not be read to suggest anything other than Chino's technical disagreements with NMED's approach to certain scientific questions that, in some cases, have become far more significant to site decisions than they were when addressed in the past, and accordingly may require a more rigourous treatment now. Chino appreciates the willingness NMED has shown to engage in constructive technical discussions in the past, and believes that Chino and NMED can have similarly productive discussions in the context of the informal dispute resolution provided in the Consent Order as a forum for addressing such issues. Please let us know if you have any questions or need any additional information regarding the issues raised in this position paper.

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ATTACHMENT A

TECHNICAL COMMENTS ON PRE-FS RAC FOR PLANTS

Technical Comments Regarding NMED's Pre-FS RAC for Plants

Chino Mines Company

Chino's technical comments on the pre-FS RAC for plants have been set forth in a number of comment letters dating back to 2003, and those comments have identified many technical uncertainties and limitations to the application of the laboratory-based phytotoxicity and field based studies. While both laboratory and field-based studies were used to support derivation of probable and *de minimus* effect levels (PEL and DEL, respectively), it is clear that the evaluation of phytotoxicity results was a driver in setting the point of departure for the PEL; whereas, the field-based vegetation community parameters more strongly influenced the DEL.

These technical uncertainties and limitations indicate that a more comprehensive evaluation of phytotoxicity response is needed to support a RAC for pCu. The laboratory phytotoxicity studies did not include a comprehensive assessment of site and background soil variability, and changing site conditions since the cessation of the smelter in 2000 and the "white rain" event. The principal technical uncertainties and limitations of the laboratory study are set forth below:

1. **Confounding Factors.** Physical and agronomic properties of the soils were not accounted for in the phytotoxicity data analysis, making it impossible for determine whether any impacts on the test plants were in fact related to copper toxicity or were due to other differences in soil characteristics. The purpose of the test was to determine copper (Cu) toxicity to plants. Confounding factors such as soil texture, % organic carbon, water holding capacity, plant nutrient levels and other agronomic properties (P-K-N ratio, CEC, etc) were not accounted for in either the interpretation or the statistical analyses of the results. Thus, the results are inconclusive with respect to Cu toxicity and may merely reflect differences in physical or non-COPC soil chemistry properties. Such studies provide no basis for a RAC based on alleged risk to plants from cupric ion activity.

2. **Controls and Reference Soils.** No descriptions of the control soils were provided in the work plan or report. This is important because the control soils were used to determine whether test soils impacted plant response. In the study, test soils were determined to be at least mildly impacted if plant survival and growth response was ≥25% lower than plants grown in control soils and ≥10% lower than plants grown in reference area soils. However, even ERA-16, the reference soil used in Phase I, exhibited many plant responses ≥25% lower compared to controls. No explanation of how this result impacted the analysis was included in the report. Importantly, no adjustment of the criteria with respect to control soils were made, even though plants grown in the reference soils also failed to meet criteria.

   To compound the issue, only a single reference area soil sample (a sample collected at ERA-16 in Phase I, ERA-21 in Phase II) was used to determine plant responses in reference areas compared to plant responses at the site. This approach is deeply under-representative of reference conditions, given the diversity of soil types in and around the site. In addition, the soil sample ERA-31 was identified as a test soil in the study, but was originally identified as a reference soil in the work plan (Schafer 1999). The soil Cu of ERA-31, which was 63 mg/kg, was less than the ERA-16 soil Cu of 80 mg/kg, which is considered within the range of background for this site). ERA-31, however, was determined to "moderately affect plant growth" compared to

ERA-16 and, overall, the plant response scores of ERA-31 were less than or equal to about half of the test soils. Thus, the variability observed between ERA-31 and ERA-16, two soils with apparent "background" concentrations of soil Cu, supports the argument that the use of only a single reference soil to evaluate site effects under-represents background conditions. This calls into question the scientific protocol and results from this study such that the use of these results is unreliable to set cleanup criteria.

3. **Discontinuity of Test Procedures.** There is a discontinuity of testing procedures used for Phase I, a range-finding exercise, compared to Phase II, which was used to determine a threshold phytotoxic response. These discontinuities include the following: 1) different reference soils were used in Phase II than Phase I; 2) different measurement endpoints used to determine plant response; and 3) except for ERA-31, different test soils were used. The same reference soil(s) and at least some (>1) of the test soils from Phase I should have been repeated for both phases of the test, and the same measurement endpoints should have been used for continuity of results. These discontinuities raise questions as to whether the Phase II tests adequately captured the range of responses between site and background.

   Further, comparison of ERA-31 data for Phase I and II suggest that responses were different between Phase I and II, calling into question whether the results of the Phase II test are fully representative of plant responses at the site. Specifically, shoot length responded significantly more poorly during Phase II while emergence and survival, as measured by 14 day counts, significantly improved (it should be noted that emergence and survival were not included in determination of plant response in Phase II but were included in Phase I). This calls into question the scientific protocol and results from this study such that the use of these results is unreliable to set cleanup criteria.

4. **Test Plant Species.** The responses of alfalfa plants in the tests were ultimately used to determine phytotoxicity levels for the site. These alfalfa plants do not reflect the potential types of native plant species that would grow on the site, nor are the responses of alfalfa to soil Cu generalizable to site conditions. This approach does not justify the proposed RAC for many reasons, including the following:

   - Alfalfa is a nitrogen-fixing legume requiring relatively large amounts of water for proper germination and growth (around 18 to 36 inches of water per growing season); such water requirements are not characteristic of the New Mexico environment and application of these watering requirements in the laboratory may have resulted in changes to the soil chemistry that would not be realized under native conditions.
   - Agricultural plants (i.e., alfalfa and ryegrass) are much more sensitive to copper than native plants. Paschke and Redente (2002) for example show that native plants growing on western rangelands in the US exhibit 1.5 – 3.5 times higher copper thresholds (EC_{50} and PT_{50}) compared to agronomic species. This makes such plants particularly inappropriate for assessing phytotoxicity at the site.
   - Many plant species adapt and thrive in mineralized areas, developing more resilience to metal concentrations than naïve plants (plants that have not adapted to a metals-enriched soil). Thus, plant toxicity tests on naïve species are unlikely to represent the phytotoxic thresholds on adapted plants, again making such plants inappropriate for assessing phytotoxicity at the site. (See for example Loneragan et al. 1981, Tyler et al. 1989, McNair 1990, Ross 1994, Kramer et al. 2000).

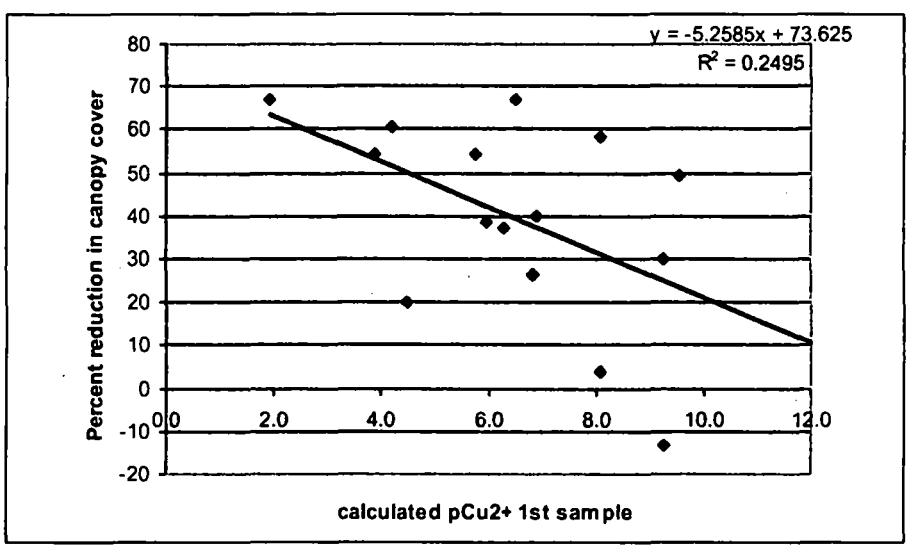
5. **Changing Soil Conditions.** A rise in temperature and a drop in soil pH occurred in nearly all of test samples and the controls used for Phase II. The drop in pH experienced by most samples

was typically 0.5, but was as much as 1.3 standard units for certain samples, yet these changes were not addressed in the discussion of the results nor accounted for in calculation of pCu phytotoxicity thresholds. The pH changes observed in the test and reference area soils would not necessarily "cancel out", as the magnitude of change in pH between site and reference soils was not equal, nor are other soil properties (e.g., nutrient levels, Cu concentrations) the same between site and reference soils. Thus, the effect of pH shifts on plant response may not be equal between site and reference area soils. More importantly, however, the changing pH demonstrates that the soils were not in equilibrium and, therefore, plant responses to site and reference conditions do not reflect the environmental conditions that will be encountered at the site. Moreover, the initial pH, rather than the final pH, was used to calculate pCu, meaning that the phytotoxicity assigned to a particular pH level by the testing in reality reflects the impact of lower pH conditions on plants.

6. **Support for pCu Threshold is not Robust.** A relationship between pCu and effects does not exist for the most ecologically significant phytoxicity endpoints (i.e., emergence and survival). Table 2.3-1 and Figure 2.5-1 clearly show no correlation between pCu and emergence and survival endpoints in the phytoxicity tests. For emergence, there are two points at pCu of 5 that show 90 and 42 percent, and then one other point at pCu 3.4 with emergence at 5 percent. Emergence and survival are the ecological relevant endpoints because plants of smaller size can support wildlife (i.e., the management goal is related to habitat quality for wildlife).

In addition, the vegetation community parameter evaluation, which was used to support the derivation of a DEL and PEL for plants at the Chino site in the ERA, is insufficient to support the proposed RAC for cupric ion activity. The ERA indicates that "*interpretation of results for vegetation community parameters is less certain due to greater variability in community endpoints*" (page 2-22). Below are the technical uncertainties and limitations of the vegetation community parameter evaluation:

The pCu varies substantially at a microscale but plant communities vary at larger scales, which creates uncertainty in the validity of the regressions. The percent of variability in cover reduction relative to the average of the reference sites explained (R^2) by pCu is highly variable from 25 to 67 percent, depending how the triplicate soil samples are used in the regression; one example is shown below relating measured pCu to the first of the triplicate samples. At the micro-scale of less than 50 m, pH is highly variable, differing by an average of 1.32 pH units (maximum of 3.5 units) on upland Chino soils and by 0.85 pH units for upland reference soils. The pCu varies also on such a microscale and its effect on the plant community is uncertain. In addition to the soil type and geochemisty, grazing is an important aspect which was not factored into the quantitative analysis. There are so many variables driving plant community patchiness, which is characteristic of a high-altitude arid ecosystem in any case, that it is difficult to use a statistical relationship based on plant community to derive a PEL or DEL to be used as a basis for future remedi
ation.



This microscale variability prevents making overarching conclusions regarding the possible impacts on the ecosystem based on pCu. The soils are naturally heterogeneous at large and small scales with varying geochemistry, cation exchange capacity, water infiltration rates, water holding capacity, acid buffering capacity, and cations competitive with Cu^{2+} for uptake sites on the root – all properties that affect phytotoxicity (Rooney et al. 2006, Warne et al. 2008) as well as vegetation community parameters. These critical factors were not accounted for in the ERA. For example, Figure 2.5-2 shows average pCu versus species richness with an r^2 of 0.58. While average pCu may be correlated to richness in this figure, the fact that there is such a wide spread in pCu for each sampling location indicates that the correlation may not have meaning relative to the ecological significance of the findings. A correlation of 0.58 is not strong and it indicates there may be other factors influencing the variable relationships.

Moreover, ERA locations were not randomly selected using a random number generator similar to that used for the Hurley composite samples and the Ecological IU RI Report (ARCADIS JSA, 2001) showed the bias associated with the sampling locations. Vegetation pattern formation and variability in semi-arid grazed ecosystems is common throughout the world. Patches may vary from small (one meter) to large (hundreds of meters in diameter) and may occur on flat surfaces as well as gentle slopes and hills. The sample transects used to gather vegetation community parameters may not have adequately reflected the natural patchiness of the STSIU. For example, one data point with total richness of 22 species has pCu ranging from less than 5 to greater than 8 while another site with the same pCu spread has less than 10 species present. The correlations are shown using average pCu but there is micro-variability that further calls into question using a PEL based upon this metric as a remediation goal.

The ERA evaluation of plant cover not only ignores the microscale variability in phytotoxicity but also does not fully address the large-scale variability created by elevation (ranges from 5,200 to 6,000 feet for upland soils), slope, aspect (direction slope faces), climate, soil type, and grazing. These factors greatly influence physical and biological responses to copper contamination and yet were not included in regressions of copper with vegetation community parameters in the ERA. Grazing and soil type have affected the quality of the vegetation independent of copper effects as shown by the finding that large areas of "poor" quality rangeland, rated by rangeland experts during a survey in 1997, do not directly coincide with the area predicted to be most severely impacted by pCu, but rather appear to be more related to grazing history and soil type. The 1997 rangeland condition survey was based on NRCS, BLM and U.S. Forest Service (USFS) approaches for ecosystem classification and evaluation of landscape ecological condition over various spatial scales. The 2C Ranch occupies 58,000 acres in the middle of the IU with documented grazing back to the 1940s with stocking rates up to 1900 animal units (AU). An evaluation of these stocking rates relative to productivity on Chino lands suggests moderate to heavy grazing on Chino lands, depending on rainfall and rangeland management. While stocking conditions improved during the 1970s, the area was continually grazed over the last 100 years. BLM indicates that the effect of grazing in New Mexico is depressed cover at 18 to 57 percent and poor to fair rangeland condition. The soil type at Chino is particularly susceptible to grazing impacts. For example, more than 53 percent of the pCu less than 6 is Muzzler Rock Outcrop/Santana soil classified as "very poor" for grasses. Overgrazing causes the soils in this unit to be subject to soil blowing and gullying and results in an increased number of undesirable plants. A "fair" rangeland condition, which is 25 to 50 percent of theoretical optimum, is consistent with what would be expected of a system exposed to over 100 years of grazing without other stressors such as copper and is consistent with the range of canopy cover observed within the area with pCu less than 6, (i.e., 27 to 58 percent).

Non-representative upland reference sites were used to evaluate canopy cover and species in order to the establish the DEL in the ERA. The unrepresentative nature of the reference sites makes this

approach fundamentally flawed: the reference sites are in a different vegetation community (mixed grama/herbaceous alliance) than the contaminated sites (mixed grama/mesquite), and these different communities and may have a different cover regardless of copper concentrations in the soil. Indeed, some Chino upland sites with pCu greater than 8 – a level clearly documented as having no adverse effects on plants – have up to a 25 to 30 percent reduction in canopy cover relative to the reference sites. This issue primarily affects how the DEL was set; however, the point of departure for the DEL also has an impact on how the PEL is determined and thus is important to consider.

In summary, there are fundamental flaws in the laboratory and field protocols, and the two taken together produce unreliable indicators of what the exact threshold should be for the PEL and DEL.

ATTACHMENT B

MEMORANDUM FROM DR. REDENTE DATED JANUARY 9, 2004

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consulting
scientists and
engineers

RECE

9 January 2004

Mr. Chris E. Eustice
Chino AOC Project Manager
New Mexico Environment Dept.
P.O. Box 26110
1190 St. Francis Drive
Santa Fe, NM 87505

Dear Mr. Eustice:

The purpose of this letter is to summarize findings from my site visit to the Chino Mine in August 2003. During my visit I had the opportunity to observe habitat in both uplands and ephemeral drainages that are believed to have been contaminated by smelter emissions and windblown tailings. I have extensive experience working at metal contaminated sites associated with mining and smelting operations and currently have research projects associated with establishing metal toxicity thresholds for native species and reclamation of metal-contaminated sites in arid and semiarid environments. The following observations were made during my site visit.

1. Studies to date have not addressed cause and effect relationships that would explain reductions in plant productivity and diversity in the Chino Mine Investigation Area. Existing field and laboratory studies suggest that elevated copper concentrations, in combination with depressed soil pH have created phytotoxic conditions in some areas of the site. The phytotoxicity studies did not use native species that either currently exist on site or would potentially grow in this area. Recent studies published in the literature show that native perennial species have higher toxicity thresholds than species like alfalfa and ryegrass. Additional studies may be needed to formally establish whether a cause and effect relationship exists.

2. The structural and functional characteristics (e.g. productivity, species composition, species diversity) of the plant communities in this area are typical of what is found on native rangeland in the southwestern U.S. It is believed that the vegetation in this area was originally (100 plus years ago) grassland with scattered shrubs. Today the area supports a more shrub dominated community type, with mesquite being the dominant woody species. Several theories have been advanced for the increase in shrubs,

the decrease in grasses, and the reduction in overall species diversity during the past 100 years. Overgrazing, lack of fire, climate change, and seed dissemination by domestic animals have all been suggested as causes for this shift in species composition. It has most likely been some combination of these factors. Since this area did not evolve with grazing by large herbivores, when livestock were introduced the combination of severe overuse and lack of adaptation to grazing produced a shrub dominated landscape with low plant cover and diversity. The Chino Mine area is an excellent example of this set of conditions and vegetation types.

3. The service that the plant communities in the Chino Mine area provide as wildlife habitat is no different that surrounding areas that have not been impacted by the release of contaminants. The overall functional characteristics of the plant communities that occur in areas of elevated metals and reduced pH are indistinguishable from areas that have background levels of soil pH and metal concentrations. I was not able to observe a reduction in quality of wildlife habitat in metal impacted areas compared to non-impacted sites.

4. Based on my observations, I would not recommend the implementation of any remedial alternatives that would result in significant disturbance to existing soils or vegetation. A physical disturbance to these plant communities would yield a condition that is far less favorable than currently exists and the time frame for recovery would be decades. In addition, there is no guarantee that there would be a measurable improvement in plant productivity and diversity or in the value of this area as wildlife habitat.

Thank you for the opportunity to provide these observations. If you need further clarification or additional information, please let me know.

Sincerely,

Edward F. Redente, Ph.D.
Corporate Consultant

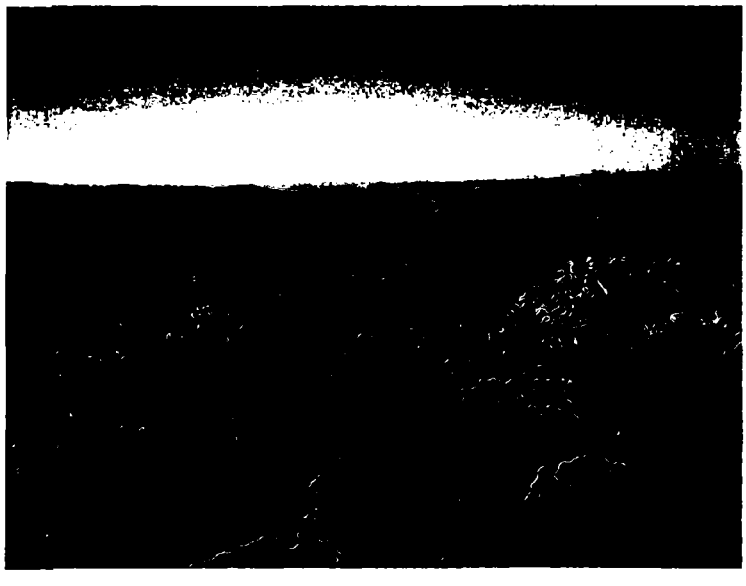
cc: Mark Lewis

ATTACHMENT C

INSECT STUDY TECHNICAL MEMORANDUM

Freeport-McMoRan Chino Mines Company
Grant County, New Mexico

Administrative Order on Consent
Terrestrial Invertebrate Copper Bioaccumulation and Bioavailability Study
Smelter/Tailing Soils Investigation Unit



Freeport-McMoRan Chino Mines Company
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ARCADIS
Infrastructure, environment, buildings

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December 31, 2010

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Glossary

AOC	Administrative Order on Consent
BAF	Bioaccumulation Factor
COC	Chain of Custody
fs	Feasibility Study
ia	Investigation Area
IU	Investigation Unit
NMAC	New Mexico Administrative Code
NMED	New Mexico Environmental Department
NOAEL	No Observed Adverse Effect Level
pH	Negative Logarithm of the Hydrogen Ion Concentration (Standard Units)
RAC	Remedial Action Criteria
RI	Remedial Investigation
STSIU	Smelter/Tailing Soils IU
USEPA	United States Environmental Protection Agency

1.0 Introduction

This report describes the September 2010 terrestrial invertebrate (insect) and soil sampling in the Smelter/Tailings Soil Investigation Unit (STSIU) to support the development of an updated soil-to-invertebrate bioaccumulation factor (BAF) for copper (Cu) and to determine the relative bioavailability of insect tissue Cu concentrations.

The original dataset of insect and soil samples at STSIU collected in 1999 (Newfields 2005) were used to compute a regression-based Cu BAF. This BAF was then used in a bird food web model to determine pre-Feasibility Study (FS) remedial action criteria (RAC) for soil at Chino. However, the technical uncertainties associated with the regression-based BAF and changing site conditions have created a need to update the BAF. In addition, bioavailability of Cu in tissues was assumed to be 100% for the purposes of determining pre-FS RAC, but this assumption has never been tested. Insects and soil in the STSIU were collected in September 2010 to determine an IU-specific Cu regression-based BAF for insects, and to measure tissue Cu relative oral bioavailability to birds that may ingest the insects.

2.0 Background and Development of Analysis Procedures

Formation Environmental (2010) recommended a range of risk-based Cu concentrations (RBCs) in soil between 626 to 829 mg/kg to be protective of small ground-feeding birds. The RBC was developed using a regression-based soil-to-terrestrial invertebrate bioaccumulation factor (BAFs) computed from site-specific data collected in 1999 (Newfields 2005). Formation Environmental (2010) identified some uncertainties associated with the derivation of the RBC (see p. 20 of the report), particularly in the use of insect data. The technical uncertainties regarding the 1999 invertebrate data include:

- Use of wet weight data;
- Composition of the invertebrates collected; and
- Using unwashed insects to determine uptake.

Inconsistency in the use of wet weight and dry weight concentration values resulted in large uncertainties with respect to actual Cu concentrations in invertebrates. Invertebrate concentrations were reported on a wet weight basis, but variability in tissue wet weight concentrations can be quite large, as much as 75 percent in some cases (Adrian and Stevens 1979). Other media concentrations were reported as dry weight concentrations and, therefore, wet weight to dry weight ratios were estimated, leading to additional uncertainties in final estimates.

Invertebrate sample sizes collected in 1999 may have been small due to limited sampling collection efforts (pit traps and limited sweeps). The samples may not have represented all the species on the site, particularly flying insects and insects in shrubs which are important food for birds in the area.

More importantly, the insects were not washed or otherwise separated from soil contamination prior to analysis of metals. Soil adhered to or in the gut of invertebrates can have an overwhelming effect on sample concentrations. Anywhere from 40% (Stafford and McGrath 1986) to 97% (Chapman et al. 1985) of metal concentrations measured in invertebrate samples can be attributable to the soil adhered to or ingested by the invertebrate. Interestingly, Stafford and McGrath (1986) showed that while highly contaminated soils can artificially elevate the final metal concentration of the sample (~40 – 60%), typical concentrations of background soils can dilute the final result, leading to under-representative metal concentrations in tissues by nearly the same magnitude of difference.

The decision of whether to use 'raw' (unwashed or otherwise uncorrected for soil content) or soil-free biota data depends on the application of the data in the risk assessment or in this case, RBC development. The RBC food web model for a ground-feeding bird employed by Formation was based on the USEPA (1993) wildlife exposure model, which separates the soil and prey components of the diet of the bird. The RBC model is as follows:

$$C_{soil} = \frac{TRV * HQ}{\left[\sum_{i=1}^{N}\left(BAF_i * P_i * IR_f * AF_f\right) + \left(P_s * IR_f * AF_s\right)\right]}$$

Where:

C_{soil}	=	dry weight COPC concentration in soil; concentration is determined by setting HQ = 1 and calculating a dose that equals the TRV.
BAF_i	=	bioaccumulation factor for the i^{th} prey item from soil
P_i	=	proportion of the i^{th} prey item in the diet
IR_f	=	ingestion rate of food plus soil
AF_f	=	bioavailability factor of food
P_s	=	proportion of total food intake that is soil
AF_s	=	bioavailability factor for soil
TRV	=	toxicity reference value
HQ	=	hazard quotient

As shown in the equation, the soil and "food" components of the diet are distinctly separate, and are derived from different means of data collection. Separate soil and prey ingestion rates (or percentages) are input into the equation, and a soil-to-invertebrate tissue BAF is used to estimate C_{soil} from observed prey tissue concentrations. Therefore, soil should not be included in prey estimates of dietary ingestion percentages or tissue concentrations because it should already be accounted for in the soil components of the equation.

Soil intake and associated dose, accounted for in the RBC model, should represent all the sources of soil to the animal. The soil percentage of the food intake that is soil (P_s *100) was originally proposed in the ERA as 10% (Appendix G, Table G-1). The 10% was obtained from Beyer et al. (1994[1]) for the American woodcock, a granivore. Beyer et al. (Beyer) determined the percentages of food and soil in the diet by measuring soil in scat samples or ingesta in large intestines of various mammals and birds. The scat or ingesta samples were ashed and then adjusted for estimated digestibility of soil and food items. Therefore, the percentage of the diet that is soil as measured by Beyer represents all the sources of soil to the animal, both through direct ingestion and indirect ingestion via soil adhered to or otherwise associated with the food samples. However, the Formation Environmental RBC model used invertebrate data from the 1999 collection which were unwashed and therefore contained soil included as part of the "prey tissue" concentrations. Formation Environmental (2010) recognized this double-counting of soil in the use of unwashed data and consequently reduced the soil percentage in the revised RBC model by one-half (from 10% to 5%) to remove the effect of soil adhered to unwashed invertebrates. However, they did not additionally compensate for the change to modeling an omnivore to calculate the pre-FS RAC (70% insects, 30% seeds in diet). An omnivore will have a lower incidental soil ingestion than a granivore because they actively seek grit for their gizzard to grind seeds, whereas omnivores typically do not (Lutik and Snoo 2004). In the NMED April 29, 2009 draft letter on the pre-FS RAC, insectivores/omnivores were modeled as having 1 to 5% incidental soil ingestion compared to 10% for

[1] The reference cited for soil ingestion rates was Beyer (1986). The full reference was not provided in the report and there is no known publication by Beyer in 1986. Therefore, we assume that the reference was mis-cited and that Beyer et al. (1994) was the source of this information.

granivores. An estimate of 2-3% soil ingestion might be reasonable for an omnivore with 70% insects in its diet because they ingest soil less frequently than granivores. In support, Lutik and Snoo (2004) found that only 33% of gizzards of a small non-granivore (reed bunting) had soil particles compared to 100% of gizzards of a similar-sized granivore (linnet, twite, and goldfinch).

A better approach, as used in this study, is to obtain a tissue-only concentration of copper, and apply reasonable estimates of soil percentages expected to be ingested for an omnivore using information in Beyer.

In addition to the technical uncertainties with the insect data described above, site conditions have also changed since the 1999 sampling of invertebrates, resulting in the potential reduction in bioavailability and hence uptake of Cu into tissues. For one, the historic Hurley smelter was shut down in 2000 and demolished in 2007. The smelter historically emitted acid-generating (thus pH-lowering) emissions and trace Cu concentrations; in the 1970s, in compliance with new Clean Air Act amendments, the two stacks on the smelter were permitted and controls were implemented to reduce emissions. Another factor is that a significant shift in pH upward was observed at STSIU following a "white rain" precipitation event on January 7, 2008 (ARCADIS 2008). During the event a milky alkaline rain containing calcium was deposited on the mine site. The change in pH due to the white rain event will lower cupric ion activity of the soil, and hence bioavailability to plants and invertebrates may also be reduced.

One additional uncertainty of the use of the insect data in the pre-FS RAC was that the bioavailability of Cu in tissues was assumed to be 100%, but this assumption has never been tested. Bioavailability can be an important component of accurate risk assessment and is gaining more widespread application as quicker, more efficient in vitro systems are being developed to measure the bioavailability of substrates.

Therefore, Chino completed an insect collection and analysis program specifically to address the technical uncertainties described above as well as collecting data that reflects current site conditions, which have changed substantially since the original data was collected in 1999. The program specifically included the following components in its field data collection and laboratory analysis program:

- Percent moisture was determined for each insect sample;
- Insects were collected using a variety of methods;
- Insect tissue results were separated from soil contamination following a 2-step process, involving washing the insects prior to analysis and verifying that the soil was removed by ashing a subsample of each insect composite, and then using the percent ash to subtract the contribution from the associated soil.
- Bioavailability of tissue samples was determined in vitro.

2.1 Methods

2.1.1 Sample Locations

The primary objective of the sampling event was to update the soil-to-invertebrate Cu BAF at the STSIU. Therefore, sampling was conducted at the same locations and during the same timeframe (early

September) previously sampled by Newfields (2005) to maintain comparability between the two collection events.

Sampling locations are shown in Figure 1. The locations of the 2010 sampling event were the same as the 1999 sampling event, and for ease of reference, the locations shown in Figure 1 are numbered. Each number corresponds to an ERA and/or STS sample, for example location 3 corresponds to ERA03 and STS-IN-2010-03. The locations sampled in 2010 include all the locations previously sampled for insects at STSIU, with the exception of ERA-01, because the soil at this location is planned to be used soon as borrow till. Three additional locations were added to the 2010 program, corresponding to areas of higher soil Cu concentrations than previously sampled, in order to make the sample size more robust and to include higher soil Cu concentrations in the dataset. These sites also provided a greater range of terrain conditions because they were on steeper slopes or high rugged, ridge tops, which differed from the ERA sites, which were in flat, low-lying areas.

At each location sampled in 1999, a 50-m transect was established from which 3 soil samples were collected from each transect (one sample at each end and one in the middle of the transect). Insects were then sampled along or nearby each transect. These former transects were located using GPS and marked. A larger area was then established around the original transect to better represent the area over which small birds could forage (Szaro and Jakle 1982). A 100 m-radius plot was established around the mid-point of each transect, and soil and insect samples were collected within the 100-m radius plot.

2.1.2 Soil Sampling and Analysis

At each location, 1 composite of 15 soil samples (0-6" depth) was collected within the 100 m-radius plot. Grab samples were collected within the plot as shown in Figure 2. Upon collection in the field, grab samples were placed on large plastic sheets and thoroughly mixed to homogenize the resulting composite sample. A ~50g sample was collected from the homogenized sample, placed in a Ziploc bag, sealed and labeled, and submitted for analysis of paste pH and total Cu for the <2mm fraction and total Cu and total volatile solids (SM 2540 E) for the <250µm fraction. Remaining soil materials were archived in the event further analyses are warranted.

One location was randomly selected for a blind field duplicate:

Duplicate ID	Original Sample
STS-SS-2010-DUP	STS-SS-2010-004

Equipment was decontaminated between sites by rinsing the equipment with DI water and phosphate-free detergent. One rinsate sample (from site STS-IN-2010-11) was collected in a 500-ml plastic bottle and the sample was preserved with 1% nitric acid for analysis of Cu. The rinsate sample was non-detect for copper (<0.01 mg/L).

2.1.3 Insect Field Collection

The primary method of collection used to accomplish a comprehensive sampling of the types of insects potentially present at each location involved using sweep nets and butterfly nets to collect ground-dwelling and plant-dwelling insects. A minimum of 50 sweeps along the ground over the area of transects established in 1999 were completed, followed by netting along the ground and in plant matter, including shrubs, within the 100-m radius plot until at least 10 g wet weight of insects were collected (average of 51 g collected). Two sites had less than 10 g (5 g in site 16 and 8 g in site 18) because insects were scarce and/or conditions were windy. To the extent possible, the locations netted were representative of the entire plot.

A supplementary insect collection method was piloted during the first days of collection, involving setting out yellow-painted pan traps which were filled with water in order to collect flying insects that may emerge close to dawn or dusk. Pan traps were placed at eight locations (sites 2, 3, 7, 8, 14, 15, 17 and 18) and checked again the following day. Although pan traps captured different types of insects (more flies, bees, ants, silverfish) than netting, the pan traps were not a robust sampling method because the biomass captured was very small. Thus this method was discontinued after the first two days. Any insects caught in the pan traps were collected using tweezers and placed in a Ziploc bag, and composited with other insects collected by netting.

After collection in the field, insects were sorted and identified to Order level, and visible plant parts removed from the insect composite. The insect composites were then weighed, and the proportions of different types of insects in the sample visually estimated. Samples were kept in Ziploc bags and stored at 4°C until laboratory analysis. Two locations were randomly selected for field duplicates from samples that contained enough biomass to allow for duplicate analyses:

Duplicate ID	Original Sample
STS-IN-2010-019	STS-IN-2010-015
STS-IN-2010-020	STS-IN-2010-012

2.1.4 Sample Preparation and BAF Computations

Soil adhered to the exterior of the insect or present in the gut of the insect can result in over- or under-estimates of tissue concentrations. Thus, removing the soil from the insect was accomplished in a 2-step process. The first step involved washing the sorted, identified composite using a spray bottle filled with deionized (DI) water. Samples were placed on a 63-µm sieve and sprayed with DI water until the effluent appeared clear (usually 2-3 passes of the spray bottle were needed). Effluent was collected into a bowl and 2 random samples of effluent were retained for qualitative particle size determination. Photos of the washing station are shown in **Appendix A.** The washing equipment was decontaminated between samples by rinsing the equipment a minimum of 3 times with tap water, followed by a DI water rinse.

The second step of the process to separate tissue concentrations from soil contamination was to determine the amount of remaining soil associated with the insect sample by ashing a subsample of

each insect composite to remove organic material, equivalent mostly to insect tissue. To represent the percent soil contribution of the insect sample, the percent ash was adjusted to include organic matter in the adhered soil that had been volatized from the sample (fraction ash divided by 1 minus the fraction of total volatile solids in soil).

When the washed (not ashed) insect samples were submitted for analysis of Cu, the resulting concentration ("Total Cu") still included a fraction of soil in the gut and potentially a small amount missed during the washing that was still adhered to the exterior of the bugs. Thus "Total Cu" is the sum of Tissue Cu + Soil Cu. The contribution of Soil Cu to Total Cu level measured in the insect sample was determined by ashing the sample to determine the soil fraction as described above, which was then subtracted from Total Cu prior to determination of BAF. The equation to calculate tissue Cu is:

$$Total\_Cu = (\%\_soil * Soil\_Cu) + (\%\_tissue * Tissue\_Cu)$$

To solve for Tissue Cu, the equation can be rearranged to:

$$Tissue\_Cu = \frac{TotalCu - (\%soil * SoilCu)}{\%\_tissue}$$

Thus, to determine accurate Tissue_Cu (mg/kg, dry weight), the following parameters were measured:

- Total_Cu (mg/kg, dry weight)
- Soil_Cu (mg/kg, dry weight)
- %_soil
- %_tissue

These parameters were measured in the following way:

Total_Cu (wet weight) was determined by ICP AES (USEPA Method 3050B / 6010B) of a 2-g homogenized subsample of insects that were collected and washed in the field. .

Soil_Cu was measured by ICP AES (USEPA Method 3050B / 6010B) of the <2 mm fraction of soil samples that were collected in the field. In the workplan, the <250 µm fraction of soil was specified because this fraction was thought to best represent the fraction of soil that is most easily sorbed onto other materials (USEPA 2007). However, there have not been any studies that have specifically examined the fraction of soil adhered to or in the gut of insects. The <250 µm fraction was sampled and analysed as planned, and results generally showed higher Cu concentrations than in the <2mm fraction. However, we chose to use the <2mm fraction instead as a more conservative estimate of soil concentration associated with the insect, given the uncertainties with the fraction of soil that best represents the sorbed fraction in and on insects.

%_soil was measured by ashing a 4g homogenized subsample of washed, oven dried insects and accounting for the volatized organic matter that was in the soil.

%_tissue was computed as 1-%_soil.

Percent moisture was determined for the soil and tissues, so that final insect tissue concentrations can be presented on a dry weight basis for the washed insects and on an ash-free dry weight (AFDW) basis for ashed insects for determination of BAFs. For comparison to 1999 data, insect concentrations are also shown on a wet weight (washed insects) and an ash-free wet weight (AFWW) basis.

2.1.5 Sample Preparation and Analysis for In Vitro Bioaccessibility

In addition to analysis of insect tissues to determine bioaccumulation of Cu, potential Cu relative oral bioavailability to birds from ingestion of insect tissues (AF_f in RBC equation) was preliminarily addressed by determining the amount of Cu liberated from an in vitro bioaccessibility test of insect tissues.

The in vitro method generally followed standard EPA in vitro protocols for the determination of lead bioaccessibility in soil, which is based on the swine model. Briefly, 1 g wet weight of the insect sample is placed into a 125-mL wide-mouth HDPE bottle. To the bottle is added 100 ± 0.5 mL of the extraction fluid (0.4 M glycine, pH 1.5). The sample is rotated end-over-end at 30±2 rpm for 1 hour while submerged in a water bath maintained at 37°C. After 1 hour, the bottle is removed, dried, and placed upright on the bench top to allow the undigested substrate to settle to the bottom. A 15-mL sample of supernatant fluid is removed directly from the extraction bottle into a disposable 20-cc syringe, and then filtered through a 0.45-µm cellulose acetate disk filter (25-mm diameter) to remove any particulate matter. The filtered samples of extraction fluid were then analyzed by ICP-AES (USEPA Method 6010).

Some modifications to this procedure were made to reflect physiologic conditions of a bird rather than swine, and also to address potential mechanisms of digestion of a high organic matter sample (i.e., insects) rather than a predominately mineralized sample (i.e., soil). These modifications included:

- Raising the pH to 2.6 (the stomach pH of a bird);
- Adjusting the water bath temperature to 42°C (the body temperature of a bird);
- Adding 0.7 g pepsin bile salts. Although EPA determined that the addition of pepsin did not affect in vitro bioaccessibility results, pepsin breaks down large organic particles and may have a more significant role in the digestion of an insect sample than in the digestion process of a soil sample.

3.0 Results

Results are described below for soil, insects and bioavailability tests. All laboratory records are included in **Appendix B.**

3.1 Soil Data

Soil data are shown in **Table 1**. At 71% of the locations, the composite soil pH in 2010 was higher than the average pH in 1999. Using a one-sided paired Wilcoxon test, the shift was statistically significant (P=0.037). The shift is probably due to the white rain event and likely also due to the cessation of smelter activity since that time. Soil copper concentrations (<2 mm fraction) changed less (lower in just over half the sites), but they were still significantly lower in 2010 using the paired one-sided Wilcoxon test (P = 0.048). The pCu also significantly shifted upward between 1999 and 2010 (P = 0.013), with 71% of the sites having higher values in 2010.

The total volatile solids (TVS) in soil used to adjust the ash percentage ranged from 3.3% to 6.3% for the <250µm samples, with an average of about 5%. TVS was not available for < 2 mm samples. The field duplicate soil sample (at site 4) was in good agreement with the original, with <10% difference in soil Cu and <1% difference in soil pH (Table 2).

3.2 Insect Data

A summary of the types of insects collected at each location is shown in Table 3. Species in the order Orthoptera (i.e., grasshoppers) were the most abundant by weight at most sites (2-15, except sites 3, 4, and 5), followed by Phasmida (walking sticks). Odonata (dragonflies and damselflies) were most abundant at sites 16 through 18. Hemiptera, Coleoptera and Leipdoptera species were found in good abundance at several sites. Hemiptera species tended to be very abundant in number (collected largely from plants), but represented only a small fraction of the total sample biomass.

Laboratory insect data are shown in Table 4. Moisture content of insects ranged from 61% to 78%, with a mean of 71%. Wet weight Cu concentrations ranged from 17 to 92 mg/kg, with an average of 37 mg/kg. When sites 2-15 were compared to the unwashed 1999 insect data (Table 5) on a wet weight basis, the copper concentrations in the 2010 washed insect samples were significantly lower (mean = 38 vs. 59 mg/kg, P= 0.022, one-sided paired Wilcoxon test), and 71% of the 2010 locations had lower insect Cu concentrations than in 1999 (Table 5). The reason for the lower insect Cu concentrations in 2010 may have been due to washing the insects, the effect of the white rain event, a result of collecting different or a wider variety of insects, declining bioavailability of Cu in the soil due to natural attenuation, or a combination of many factors. Nevertheless, the 2010 insect data are encouraging and indicates that Cu exposure to insects and their predators at STSIU is declining or may be lower than previously assumed. This trend is particularly noticeable closer to the smelter because many of the locations with lower pCu and lower insect Cu concentrations were near the smelter.

Dry weight Cu concentrations of the two blind duplicate pairs (Table 2) differed by 22% and 33%, which is considered in generally good agreement for the purposes of this study (given one large insect in one

sample and missing from another can cause high variability). The average values from the original sample and the blind duplicate sample were used for all subsequent BAF calculations.

The ash content of insect samples ranged from 2.5 to 10%, indicating a large amount of soil was still associated with the insect samples. When soil Cu concentrations (<2mm fraction) were incorporated into the AFDW calculation, site 17 resulted in a negative tissue Cu. The Cu concentration of this insect composite (17 mg/kg wet wt) was the lowest of all composite samples, despite having the highest soil Cu concentration (>2000 mg/kg). The composition of insects in this sample was also different than at other sites: there was a high fraction of flying insects (Odonata, Hymenoptera) which was not typical of most sites, and Hymenoptera and Mantodea species were collected here but not elsewhere. The flying insects could have originated from an area outside of the assumed soil exposure area that was sampled concurrently with the insects, or in general these insects may have had a wider foraging area than the other insects. Also, because the soil Cu concentration was very high at this site, even small measurement errors in the pre-ashed and post-ashed weights could have resulted in an overestimate of the amount of soil associated with the insects, further contributing to obtaining a negative concentration. Because of the low tissue Cu concentrations and the apparent disassociation between soil Cu and insect tissue Cu, this sample was excluded from the BAF calculations when using the ash-free prey Cu concentrations in the RBC model.

A striking result of the insect data collected in 2010 was that insect tissue concentrations, either washed or on an AFDW basis, remained very consistent despite differences in associated soil concentrations. Some of the lowest tissue concentrations were measured in areas with the highest soil concentrations (sites 16 through 18), actually producing a flat regression slope (slope not significantly different from zero, P = 0.6287) based on just the washed insect data (Figure 3). The AFDW dataset (without site 17) resulted in a relatively flat slope, also (not significantly different from zero, P = 0.471, Figure 4). A significant positive relationship was observed in the 1999 data set (Figure 5), but this is unsurprising given that the insects were unwashed.

The soil to insect Cu 1999 natural log BAF regression ($lnCu_{soil}$ vs. lnBAF, Figure 6) was updated with the 2010 washed and AFDW BAF data (Tables 5 and 6, Figures 7 and 8). The 2010 BAF regressions predict lower insect tissue Cu for the same soil Cu than the 1999 regression (based on soil Cu concentrations at <2mm).

3.3 Bioavailability

The in vitro bioaccessibility (IVBA) results are shown in Table 7. IVBA of insect tissues ranged from 57 to 91%, with a mean of 73%. However, if the percent IVBA were applied to the washed insect data (mg/kg wet weight), the resulting bioavailable Cu in each insect tissue essentially matches that of the ash-corrected data (Table 7). Thus, the comparison provides support that the ash-corrected insect Cu concentrations represent the bioavailable portion of total Cu that predators (i.e., birds) will absorb through the gut, resulting in toxicological effects.

This also suggests that, in effect, Cu in insect organic tissue is mostly bioavailable (near 100%), whereas Cu in the soil in the ash is mostly unavailable (near 0%). The <100% bioavailability determined

in the washed insects is probably due to the small amount of soil still remaining in the gut or adhered to the unwashed insect.

4.0 Updates to the RBC Equation and Pre-FS RAC calculation

The updated BAF regression model using the washed insect data (Figure 7) was input into the RBC model to examine the impact on calculations of a bird RAC. Using the input parameters specified in Formation Environmental (2010), except for using the 2010 washed insect BAF and 73% bioavailability of insects, a STSIU-specific bird RAC is calculated at 6,051 mg/kg soil (Table 8). The soil percentage (P_s) used in the RBC equation was conservatively set at 5%, rather than 2-3% that probably is more typical of insectivorous/omnivorous birds.

For RBC calculations based on AFDW-based BAF (Figure 8), tissue bioavailability was assumed to be 100% because the bioavailability test was not performed on AFDW insects, but rather on washed insects. The calculated RBC using AFDW-based BAF and 100% prey availability is much higher, at 8,609.

The pre-FS FAC calculated using a granivore with a diet of 100% seeds is 7,344 mg/kg if the incidental soil ingestion is 5%, based on 1999 soil Cu to seed Cu BAFs in Formation Environmental (2010). If a more conservative soil ingestion of 10% is used (ignoring double-counting of soil on the 1999 unwashed seeds), the pre-FS RAC is lower at 4,031. Thus, the Pre-FS RAC range (depending on the scenario) is from about 6,000 to 8,000 mg/kg for omnivorous bird and ranges from 4,000 to 8,000 mg/kg Cu for all types of birds, which is much higher than the 626 mg/kg calculated in Formation Environmental (2010).

5.0 Discussion

5.1 Uncertainty in Results

Uncertainty exists in the calculation of the Pre-FS RAC, particularly in regard to the the Cu concentration in tissue after ashing, soil bioavailability fraction (AF_s) and soil ingestion proportion (P_s). In the current study, the insect samples were ashed, and the weight of the ash was assumed to equal the weight of the soil in/on the insects. Among the methods described in the literature, Stafford and McGrath (1986) proposed ashing insects and subsequently digesting the ash using a strong acid. Not digesting the ash in acid could have resulted in an underestimate of the amount of Cu in the insect tissue (see **Appendix C**). Nevertheless, the results for the ashing compared to the in vitro bioaccessibility test suggest the bioavailability fraction (AF_s) for soil may be too high. The percent of the food ingestion in soil is uncertain because definitive studies are not available for omnivorous birds that primarily feed on invertebrates. However, to reach a 626 mg/kg Pre-FS RAC would require a >50% soil ingestion rate if either the washed or AFDW insect data was used. Such values are unrealistic because the highest estimate in Beyer et al. (1994) for terrestrial species was 10% for species that actively seek soil as grit.

5.2 Chino Results Compared to Other Insect Studies

Copper is an important micronutrient and, unlike non-essential metals, may be homeostatically regulated up to a certain level, which could be one explanation for why the slope of insect Cu versus soil Cu is flat. The absence of an increasing trend appears to be atypical, however; in the only other study found (Karadjova and Markova 2009) in which terrestrial insects were collected and "washed" (via ultrasonication), grasshopper body burdens still tended to increase with (presumably) increasing soil Cu associated with distance from a smelter. However, the comparison may be still be apples-to-oranges: only one order of insect (grasshoppers) was collected in the Markova study, whereas multiple insect orders were collected at Chino, and the soil was removed from the insects via ultrasonic bath rather than washing, so efficiency of soil removal may have differed. Also, the Cu soil concentrations of the Karadojova and Markova study area were low (10-34 mg/kg reported in Shegunova 2001 for an area covering same area as that study) compared to the Chino study area.

Despite the consistent tissue results between background or low-impacted (100-300 mg/kg) and higher-impacted (>300 mg/kg) soils, tissue Cu concentrations in insect samples at Chino remain higher than "reference" sites collected throughout the world (Table 9). Explanations as to why these results do not correspond to other insect uptake studies can be due to soil Cu of "reference" areas in the published studies tending to be low (~20 mg/kg in the world on average, Shegunova 2001), but not deficient (Hopkin 1992). The insects exposed to higher Cu concentrations in Chino may have adapted to maintaining a higher steady state Cu concentration in their tissues. Differences in the kinds of insects collected in the published studies compared to those in the Chino study might also make a difference if the insects at Chino regulate Cu at higher levels. Larvae and juveniles in particular tended to have lower Cu concentrations than their adult counterparts (e.g., Lindqvist 1992), and some of the studies in Table 9 may have had more larvae/juveniles than in the Chino samples. Another explanation may be that soil Cu bioavailability could be lower in most of the "reference" sites evaluated in Table 9, because these sites tended to consist of undisturbed areas with no known pollution source; thus the soil Cu is more likely in highly weathered, recalcitrant (thus largely non-bioavailable) forms. Finally, as shown in Stafford

and McGrath (1986), locations with low soil metal concentrations can dilute an unwashed or partially-washed insect sample, resulting in under-representative invertebrate metal concentrations. Despite the uncertainty in the explanation for the trend, the results suggest the invertebrates available for birds to prey upon have relatively low copper concentrations in their tissue throughout the site, and the main challenge for the birds is the incidental ingestion of soil high in copper.

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Tables

Table 1. 2010 Soil data collected for the insect study.

2010 Soil Sample ID	Corresponding 1999 Location	<2mm fraction of soil								<250um fraction of soil	
		Soil pH (0-6")			Soil Cu (mg/kg 0-6")			Soil pCu (0-6") calculated		2010 soil Cu[2] (mg/kg)	Total Volatile Solids (%)
		1999 soil pH[1] (avg)	1999 soil pH[1] (max)	2010 soil pH[2]	1999 soil Cu[1] (avg)	1999 soil Cu (min)	2010 soil Cu[2]	1999 soil pCu[1]	2010 soil pCu[2]		
STS-SS-2010-002	ERA02	4.8	4.9	6.2	811	694	860	4.1	5.3	902	4.8
STS-SS-2010-003	ERA03	5.0	6.8	6.5	709	521	625	4.4	6.0	956	4.3
STS-SS-2010-004	ERA04	4.8	5.1	6.3	541	360	486	4.6	6.1	753	3.3
STS-SS-2010-005	ERA05	6.6	7.8	6.4	521	80	238	6.3	7.0	511	3.5
STS-SS-2010-006	ERA06	6.7	7.8	6.3	499	291	622	6.4	5.8	837	3.3
STS-SS-2010-007	ERA07	5.5	7.9	6.7	789	402	758	4.8	5.9	816	3.8
STS-SS-2010-008	ERA08	7.0	7.3	7.0	710	685	643	6.3	6.4	645	3.3
STS-SS-2010-009	ERA09	4.3	4.4	4.6	546	502	291	4.1	5.1	431	4.6
STS-SS-2010-010	ERA10	4.5	4.9	5.4	485	395	197	4.4	6.3	432	4.8
STS-SS-2010-011	ERA11	7.7	7.8	7.0	276	210	277	8.1	7.4	393	5.8
STS-SS-2010-012	ERA12	7.8	8.0	7.8	204	96	215	8.4	8.4	366	5.1
STS-SS-2010-013	ERA13	4.8	5.8	6.3	161	4	186	6.0	7.2	485	5.2
STS-SS-2010-014	ERA14	7.7	7.8	7.5	109	100	129	9.1	8.7	184	6.3
STS-SS-2010-015	ERA15	7.7	7.9	7.8	712	584	529	7.0	7.4	837	6.3
STS-SS-2010-016	(NEW)	n/a	n/a	4.9	n/a	n/a	1120	n/a	3.8	1790	5.0
STS-SS-2010-017	(NEW)	n/a	n/a	6.0	n/a	n/a	2060	n/a	4.1	3080	5.3
STS-SS-2010-018	(NEW)	n/a	n/a	6.0	n/a	n/a	1100	n/a	4.9	2420	5.3

Notes:

[1] mean of 3 samples on 50-m transect

[2] composite of 15 samples in 100-m radius area (wet weight)

n/a = not applicable. Location not sampled in 1999.

Blue highlighted cells indicate 2010 Cu < 1999 Cu, and 2010 pH or pCu > 1999 values.

Table 2. Summary of blind field duplicate samples.

Location	Sample ID	Matrix	Sample Type	Cu (mg/kg wet)	pH	% Moisture	Cu (mg/kg dry)	% TVS	% Ash remaining
12	STS-IN-2010-012	Insect	Original	28	—	73.3	106	91.3	8.7
12	STS-IN-2010-020	Insect	Duplicate	40	—	73.0	148	96.2	3.8
15	STS-IN-2010-015	Insect	Original	101	—	71.4	353	94.2	5.8
15	STS-IN-2010-019	Insect	Duplicate	83	—	70.5	283	94.6	5.4
4	STS-SS-2010-004	Soil, <2mm	Original	486	6.3	3.40	503	—	—
4	STS-SS-2010-DUP	Soil, <2mm	Field Dup	530	6.3	3.3	548	—	—
4	STS-SS-2010-004	Soil, <250um	Original	753	—	0.3	755	3.3	96.73
4	STS-SS-2010-DUP	Soil, <250um	Field Dup	730	—	0	730	3.2	96.79

Notes:
TVS = total volatile solids
— = parameter not measured for this sample.

Table 3. Taxonomic order composition (%) of insect samples.

Sample ID	2010 Copper (mg/kg)	Orthoptera	Coleoptera	Hemiptera	Odonata	Lepidoptera	Phasmida	Other	Other - notes
STS-IN-2010-02	860	80	0	10	0	10	0	0	
STS-IN-2010-03	625	11	0	48	20	2	21	<1%	1 Ephemoptera
STS-IN-2010-04	486	0	5	5	5	0	85	0	
STS-IN-2010-05	238	25	10	10	0	4	51	0	
STS-IN-2010-06	622	45	0	36	3	1	15	0	
STS-IN-2010-07	758	32	32	1	15	20	0	0	1 very large catepillar (Lepidoptera)
STS-IN-2010-08	643	95	0	5	0	0	0	0	
STS-IN-2010-09	291	80	5	6	5	4	0	1	
STS-IN-2010-10	197	60	30	6	0	0	3	0	
STS-IN-2010-11	277	99	1	0	0	0	0	0	
STS-IN-2010-12	215	97	0	0	0	0	3	0	
STS-IN-2010-13	186	90	<1	0	5	5	1	0	
STS-IN-2010-14	129	58	15	15	0	0	0	12	2% small brown worms
STS-IN-2010-15	529	99	1	0	0	0	0	0	
STS-IN-2010-16	1120	0	0	5	70	20	0	5	
STS-IN-2010-17	2080	0	10	<1%	35	10	30	15	10% wasps (Hymenoptera) + 5% praying mantis (Mantodea)
STS-IN-2010-18	1100	5	10	0	80	5	0	0	
Average %:	608	52	8	8	14	4	12	3	

Table 4. 2010 insect copper concentrations, TVS and moisture data.

Location	Sample ID	Insect Cu (mg/kg wet washed)[1]	% Insect Sample Moisture	Insect Cu (mg/kg dry washed)	% TVS in insect samples	% Ash content of insect samples
2	STS-IN-2010-002	48.5	72.4	176	94.7	5.3
3	STS-IN-2010-003	40.7	63.2	111	92.4	7.6
4	STS-IN-2010-004	29.6	67.8	92	89.8	10.2
5	STS-IN-2010-005	21.9	70.5	74	90.9	9.1
6	STS-IN-2010-006	55.7	65.8	163	91.2	8.8
7	STS-IN-2010-007	16.9	75.3	68	93.1	6.9
8	STS-IN-2010-008	46.4	71.4	162	92.1	7.9
9	STS-IN-2010-009	41.9	72.9	155	94.6	5.4
10	STS-IN-2010-010	28.5	71.6	100	94.2	5.8
11	STS-IN-2010-011	27.5	71.1	95	93.7	6.3
12	STS-IN-2010-012	34.1	73.2	127	93.8	6.3
13	STS-IN-2010-013	33.5	71.0	116	96.4	3.6
14	STS-IN-2010-014	19.5	77.7	87	97.5	2.5
15	STS-IN-2010-015	92.2	71	318	94.4	5.6
16	STS-IN-2010-016	39.8	61.1	102	94.1	5.9
17	STS-IN-2010-017	17.5	70.7	60	91.9	8.1
18	STS-IN-2010-018	34.3	74.9	137	94.7	5.3

Notes:

TVS = total volatile solids

[1]includes soil in gut and adhered to insect that was not completely removed by washing

Table 5. 1999 soil and unwashed insect data summary compared to washed or ash-free 2010 insect data.

Location	1999 Sample ID	1999 Soil Cu (mg/kg)[1]	1999 Insect Cu (mg/kg wet wt)	1999 Insect Cu (mg/kg dry wt)[2]	1999 BAF (wet wt)	1999 BAF (dry wt)	2010 Insect Cu (mg/kg wet wt washed)	2010 BAF (Washed)	2010 BAF (AFWW)
2	ERA02	694	58	200	0.08	0.29	49	0.06	0.04
3	ERA03	789	74	254	0.09	0.32	41	0.07	0.04
4	ERA04	360	56	194	0.16	0.54	30	0.06	0.03
5	ERA05	80	48	164	0.60	2.06	22	0.09	0.07
6	ERA06	291	68	234	0.23	0.81	56	0.09	0.06
7	ERA07	1220	99	341	0.08	0.28	17	0.02	0.00
8	ERA08	716	135	466	0.19	0.65	46	0.07	0.05
9	ERA09	603	51	177	0.09	0.29	42	0.14	0.14
10	ERA10	488	11	37	0.02	0.08	29	0.14	0.13
11	ERA11	244	26	89	0.11	0.36	28	0.10	0.08
12	ERA12	96	19	66	0.20	0.69	34	0.16	0.15
13	ERA13	157	48	165	0.31	1.05	34	0.18	0.18
14	ERA14	102	49	169	0.48	1.66	20	0.15	0.15
15	ERA15	658	89	307	0.14	0.47	92	0.17	0.17
16	n/a	---	---	---	---	---	40	0.04	0.01
17	n/a	---	---	---	---	---	18	0.01	n/a
18	n/a	---	---	---	---	---	34	0.03	0.02

Notes:

[1] soil copper concentration data from "location 1" samples collected in 1999 (following Newfields 2005)

[2] Dry weights estimated using average of 71% moisture, based on avg of 2010 data.

Blue highlighted cells indicate 2010 Cu < 1999 Cu in insects

AFWW - Ash free wet weight

Table 6. Insect Cu BAF computations on ash-free dry weight of insects from the 2010 data.

		Soil Copper @ <2mm						Insect BAF Calculations (based on <2mm)					
Location	Sample ID	Soil Cu (mg/kg wet wt)	% Soil Moisture (<2mm)	Soil Cu (mg/kg dry wt)	Ln Soil Cu (wet wt)	Ln Soil Cu (dry wt)	% TVS soil (<250µm)	Insect Cu, AFDW[1]	Insect Cu, AFWW[1]	2010 BAF (AFDW)	2010 BAF (AFWW)	Ln BAF (AFDW)	Ln BAF (AFWW)
2	STS-IN-2010-002	860	6.00	915	6.8	6.8	4.8	132	36.47	0.14	0.04	-1.93	-3.16
3	STS-IN-2010-003	625	5.90	664	6.4	6.5	4.3	83	23.12	0.09	0.04	-2.36	-3.30
4	STS-IN-2010-004	508	3.30	525	6.2	6.3	3.3	41	13.15	0.08	0.03	-2.55	-3.65
5	STS-IN-2010-005	238	3.80	247	5.5	5.5	3.5	56	16.58	0.23	0.07	-1.48	-2.66
6	STS-IN-2010-006	622	4.30	650	6.4	6.5	3.3	114	39.02	0.18	0.06	-1.74	-2.77
7	STS-IN-2010-007	758	5.60	803	6.6	6.7	3.8	12	2.88	0.01	0.00	-4.23	-5.57
8	STS-IN-2010-008	643	2.70	661	6.5	6.5	3.3	118	33.71	0.18	0.05	-1.72	-2.95
9	STS-IN-2010-009	291	7.40	314	5.7	5.8	4.6	145	39.30	0.46	0.14	-0.77	-2.00
10	STS-IN-2010-010	197	5.80	209	5.3	5.3	4.8	93	26.50	0.45	0.13	-0.81	-2.01
11	STS-IN-2010-011	277	4.50	290	5.6	5.7	5.8	81	23.46	0.28	0.08	-1.27	-2.47
12	STS-IN-2010-012	215	3.90	224	5.4	5.4	5.1	120	32.28	0.54	0.15	-0.62	-1.90
13	STS-IN-2010-013	186	3.50	193	5.2	5.3	5.2	112	32.62	0.58	0.18	-0.54	-1.74
14	STS-IN-2010-014	129	6.60	138	4.9	4.9	6.3	86	19.19	0.62	0.15	-0.47	-1.91
15	STS-IN-2010-015	529	4.50	554	6.3	6.3	6.3	303	87.85	0.55	0.17	-0.60	-1.80
16	STS-IN-2010-016	1120	7.50	1211	7.0	7.1	5.0	29	11.25	0.02	0.01	-3.73	-4.60
17	STS-IN-2010-017	2060	7.50	2227	7.6	7.7	5.3	-143	-41.88	—	—	—	—
18	STS-IN-2010-018	1100	5.30	1162	7.0	7.1	5.3	76	19.04	0.07	0.02	-2.73	-4.06

Notes:
AFDW - Ash free dry weight (adjusted for total volatized solids in soil)
AFWW - Ash free wet weight (adjusted for total volatized solids in soil)
TVS - Total volatilized solids

Table 7. Insect Cu bioavailability computations from the 2010 data.

Sample ID	Washed Insect Cu (mg/kg wet wt)	Extraction Fluid Cu (mg/L)	In vitro bioaccessibility (%)	Bioavailable Cu in Washed Insects (mg/kg wet wt)	Insect Cu (AFWW, mg/kg wet wt)
STS-IN-2010-002	48.5	0.335	69	34	36
STS-IN-2010-004	29.6	0.17	57	17	13
STS-IN-2010-005	21.9	0.142	65	14	17
STS-IN-2010-010	28.5	0.242	85	24	26
STS-IN-2010-014	19.5	0.177	91	18	19

Notes:

Insect mass = 1g; Extraction Fluid Volume = 0.1L

mg/kg = milligram per kilogram

% = percent

Table 8. Input parameters used to compute the bird Copper RAC.

Parameter	Unit	Washed Insect Data	AFDW Insect Data	Citation
Receptor	—	SGFB	SGFB	
Diet	—	*omnivore*	*omnivore*	
BWbirds	g	12.00	12.00	Formation Environmental (2010)
FIR	g dry /day	3.44	3.44	Nagy (2001), all passerine birds
TRV	mg/kg-bw day	42	42	Formation Environmental (2010)
HQ	—	1	1	
Cseed	mg/kg dry	51	57	Calculated from BAF regression
Cinvert	mg/kg dry	116	31	Calculated from BAF regression
% diet seed	%	30%	30%	Formation Environmental (2010)
% diet foliage	%	0%	0%	Formation Environmental (2010)
% diet invert	%	70%	70%	Formation Environmental (2010)
IRfood,wt-specific	g dry/g bw	0.29	0.29	Calculated from FIR and BW
IRsoil,wt-specific	g dry/g bw	1.5E-02	1.5E-02	Calculated from FIR, % Ingestion Soil, and BW
AF prey	—	73%	100%	73% from IVBA results; 100% is default assumption
AF soil	—	25%	25%	Formation Environmental (2010)
% diet soil	%	5%	5%	Formation Environmental (2010)
SlopeBAF,seeds	—	-0.7002	-0.7002	Formation Environmental (2010)
IntcptBAF,seeds	—	1.3300	1.3300	Formation Environmental (2010)
SlopeBAF,foliage	—	-0.3933	-0.3933	2010 BAF Regression
IntcptBAF,inverts	—	4.7489	6.3092	2010 BAF Regression
RAC - Soil	mg/kg	6,051	6,609	

Notes:
SGFB = small ground feeding bird
BW - body weight
FIR - food ingestion rate
TRV - toxicity reference value
HQ - hazard quotient

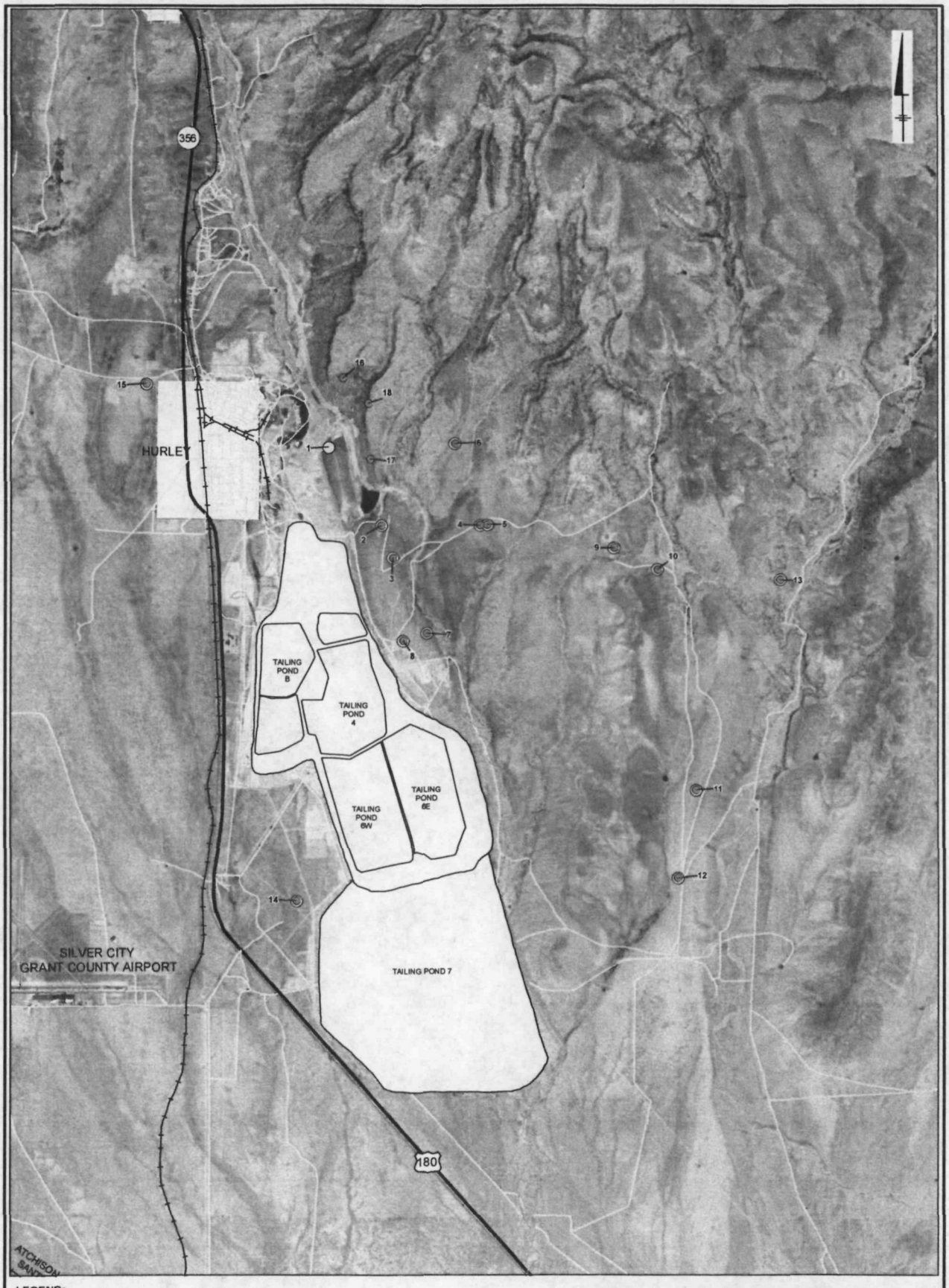
Table 9. Other Reference Data.

Scientific Name	Common Name	Sample Detail	Location	Site Description	Reference	Year collected	Insect Cu (ppm dry weight) [3]	Sample Size	Insect Cu Average (ppm dry weight)	Insect Cu Maximum (ppm dry weight)
Apis mellifera	Honeybee	foraging workers	Czechoslovakia	reference site	Eisler 2000	1985 - 1987	20 - 24	not reported	22	24
Apis mellifera	Honeybee	honey	Czechoslovakia	reference site	Eisler 2000	1985 - 1987	0.6	not reported	0.6	
Apis mellifera	Honeybee	pollen	Czechoslovakia	reference site	Eisler 2000	1985 - 1987	5.4	not reported	5.4	
Arianta arbustorum	Landsnail	soft parts	Innsbruck, Austria	reference site	Eisler 2000	1987	84 (45 - 104)	not reported	84	104
Bombus spp	Bumblebee	queens	Sweden	unk	Eisler 2000	1991	19-23	not reported	20.5	23
Bombus spp	Bumblebee	whole	Sweden	unk	Eisler 2000	1991	11-38	not reported	24.5	38
Bupalus piniarius	Pine moth	pupae	Finland	reference site, 20 mg/kg	Eisler 2000	1987	63 (max)	not reported		63
Lumbricus rubellus	Earthworm	anterior alimentary canal	Cardiff, Wales	reference site	Eisler 2000	1984	18.2	not reported	18.2	
Lumbricus rubellus	Earthworm	posterior alimentary canal	Cardiff, Wales	reference site	Eisler 2000	1984	21.1	not reported	21.1	
Lumbricus rubellus	Earthworm	remainder	Cardiff, Wales	reference site	Eisler 2000	1984	10.1	not reported	10.1	
Magicicada spp	Cicadas (17-yr old)	whole	Maryland	unk	Eisler 2000	1987	37.2 - 60.3	not reported	40.75	60.3
Panolis flammea	Pine noctuid	pupae	Finland	reference site	Eisler 2000	1987	20 (max)	not reported		20
Psithyrus bohemicus	Cuckoo bumblebee	queens, whole	Sweden	unk	Eisler 2000	1991	18 (12 - 29)	not reported	18	29
Argiope aurantia	Garden orb weaver spider	whole	US	reference site	Eisler 2000	unk	80	not reported	80	
Lycosidae spp	Wolf spider	whole	US	reference site	Eisler 2000	unk	89	not reported	89	
Dolerus [illegible]	Sawfly	larvae	[illegible], Sweden	background site [1]	Lindqvist 1992	1989	15.1 (13.9-16.2)	4	15.1	16.2
Dolerus [illegible]	Sawfly	adult, caught in wild	[illegible], Sweden	background site [1]	Lindqvist 1992	1990	41.5 (37.8-44.5)	5	41.5	44.5
Diprion pini	common pine sawfly	larvae	[illegible], Sweden	background site [1]	Lindqvist 1992	1989	10.4 (9.5-11.3)	6	10.4	11.3
Diprion pini	common pine sawfly	adult, reared in lab, fed wild-caught plants	[illegible], Sweden	background site [1]	Lindqvist 1992	1990	40.5	1	40.5	40.5
Aglais urticae	Tortoiseshell butterfly	larvae	[illegible], Sweden	background site [1]	Lindqvist 1992	1989	11.5 (10.3-13.5)	3	11.5	13.5
Aglais urticae	Tortoiseshell butterfly	adult, reared in lab, fed wild-caught plants	[illegible], Sweden	background site [1]	Lindqvist 1992	1990	16.6 (15.3-18.4)	3	16.6	18.4
Tortrix viridana	Green oak moth	larvae	[illegible], Sweden	background site [1]	Lindqvist 1992	1989	8.0 (7.3-8.8)	6	8	8.8
Tortrix viridana	Green oak moth	adult, reared in lab, fed wild-caught plants	[illegible], Sweden	background site [1]	Lindqvist 1992	1990	18.5 (10.0-24.8)	4	18.5	24.8
Empria [illegible]	Sawfly	larvae	[illegible], Sweden	background site [1]	Lindqvist 1992	1989	6.6 (6.1-6.8)	3	6.6	6.8
Empria [illegible]	Sawfly	adult, caught in wild	[illegible], Sweden	background site [1]	Lindqvist 1992	1990	25.8	1	25.8	25.8
Orthoptera, Acrididae	Grasshoppers	adults, spring, washed	Plovdiv, Bulgaria	background site [4]	Martinova 2000	unk	21 (22 upper quartile)	6	21	22
Orthoptera, Acrididae	Grasshoppers	adults, summer, washed	Plovdiv, Bulgaria	background site [4]	Martinova 2000	unk	41 (42 upper quartile)	6	41	42
Orthoptera, Acrididae	Grasshoppers	adults, fall, washed	Plovdiv, Bulgaria	background site [4]	Martinova 2000	unk	40 (43 upper quartile)	6	40	43
Various	7 families: bees, wasps, true bugs, leafhoppers, dragonflies, and others	whole	Arizona	background site [2]	Moore et al 2000	1990	33.2 (27.1 - 44.6)	6	33.2	44.6

Notes:
(1) Insect samples collected from [illegible], Sweden, presumably associated with the observatory station there. Soil copper concentrations presumed to be background, <20 mg/kg. Plant Cu concentrations were all within background according to Eisler (2000).
(2) San Pedro riparian zone and Roosevelt Lake, Arizona not known to have elevated copper concentrations in associated media; presumed to be background.
(3) as reported in the study; averages shown where reported, with ranges in parenthesis. "(max)" indicates only the maximum concentration was reported. All results reported in mg/kg or ug/g dry weight.
(4) soil concentrations not reported but site 1 was identified as "background".

ARCADIS

Figures



LEGEND:

- "STS" Insect and Soil Sample Locations, 2010
- "ERA" Insect and Soil Sample Locations, 1999

0 4,000 8,000 Feet

GRAPHIC SCALE

DRAFT

CHINO MINES COMPANY
HURLEY, NM

STSIU

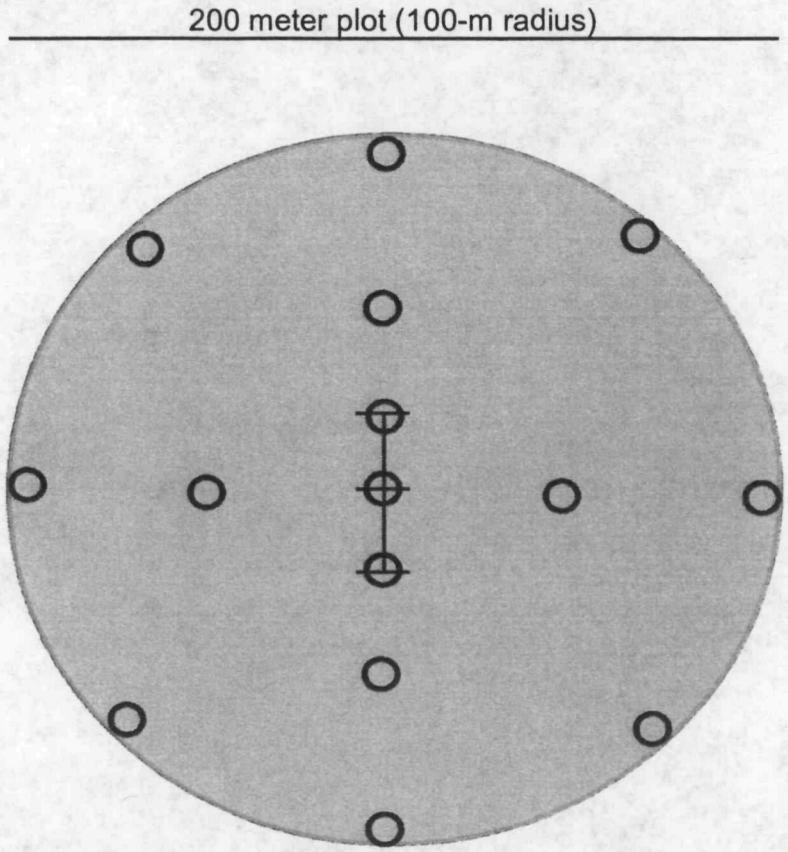
INSECT AND SOIL SAMPLE LOCATIONS FROM 1999 AND 2010

ARCADIS

FIGURE 1

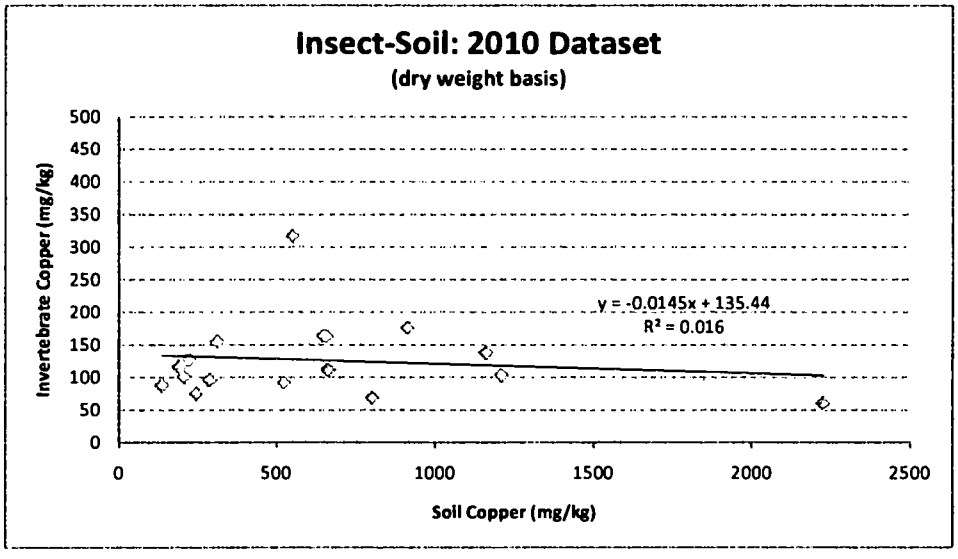
6/14/06 PET-85 EGH
Project #B35190.002
D:\FCR\Chino\2010\MXD\STSIU_InsectSoilLocations_110410.mxd

Figure 2. Soil Sample Grab Locations within Each 100-m Radius Plot



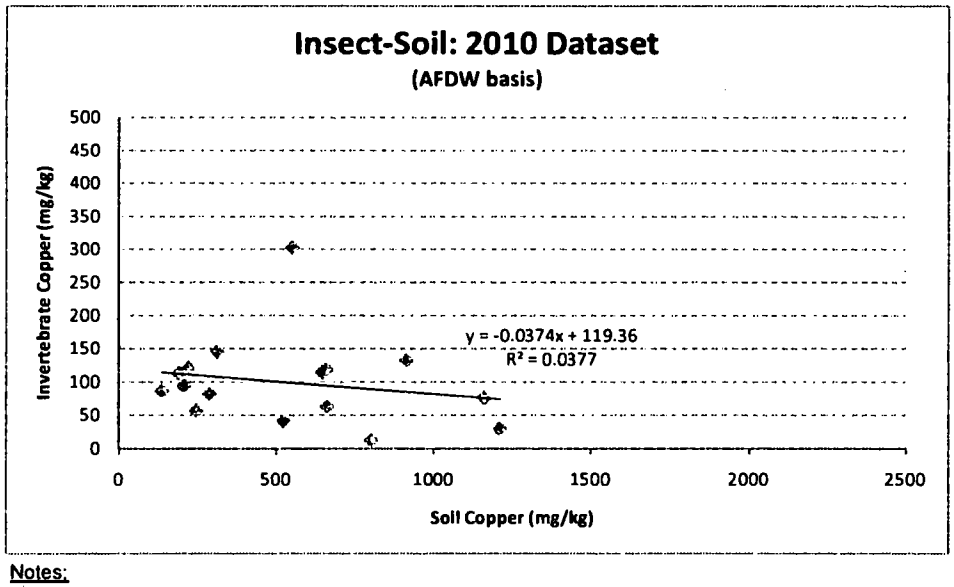
O Soil sampling location 2010
Transect location established 1995
Note: figure not to scale.

Figure 3. Regression of insect tissue and soil Cu concentrations for washed samples.



Notes:
Insect data on dry weight basis but not corrected for soil content.

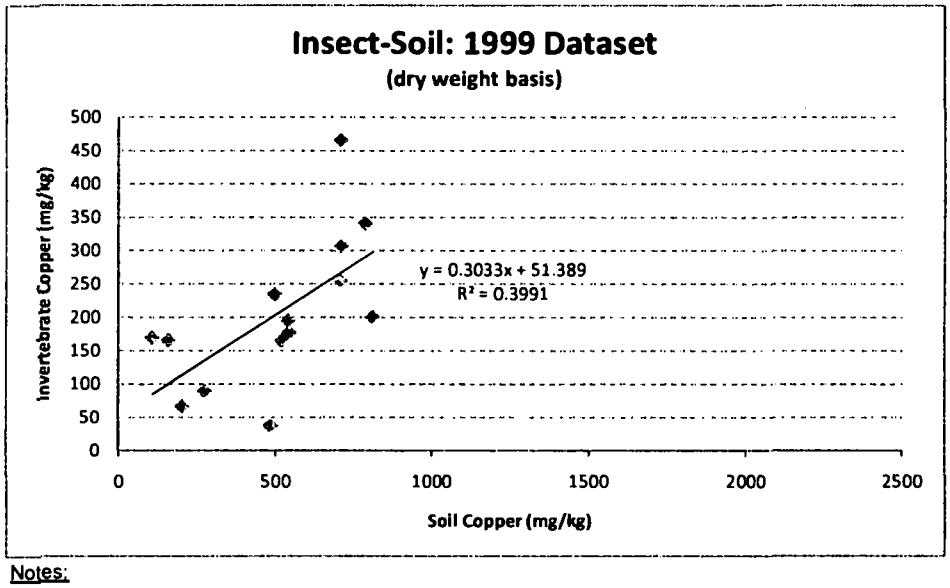
Figure 4. Regression of AFDW insect tissue and soil Cu concentrations excluding site 17.



Notes:

Insect data on AFDW basis for sites 1-16 and site 18.

Figure 5. Regression of insect tissue and soil Cu concentrations from 1999 dataset.

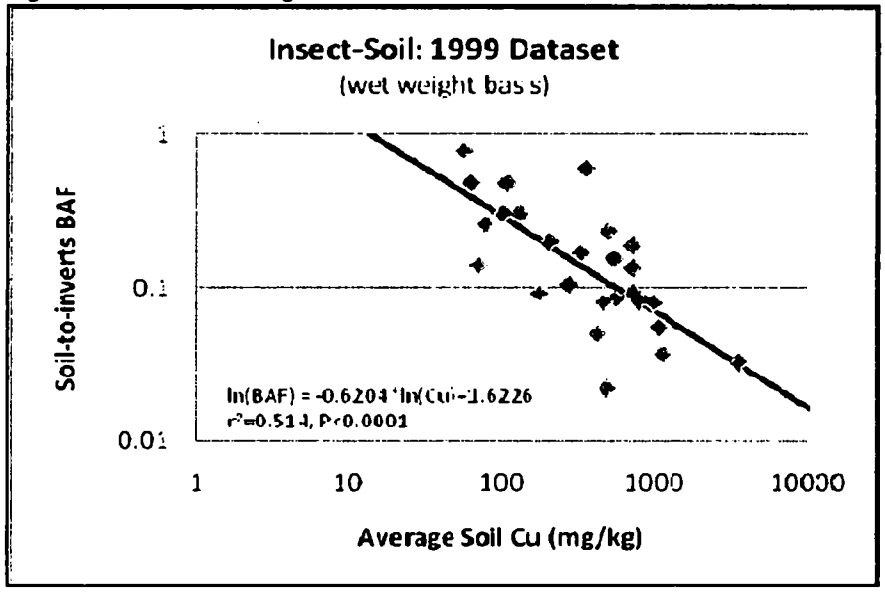


Notes:

Soil copper based on average of all 3 soil samples at each location

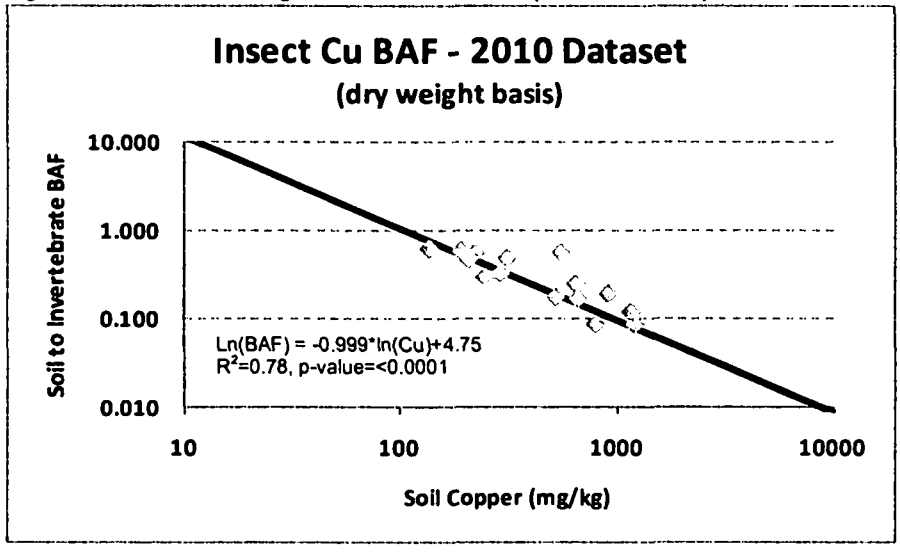
Insect data converted to dry weight assuming 71% moisure (avg of 2010 data)

Figure 6. Insect Cu BAF regression with 1999 data.



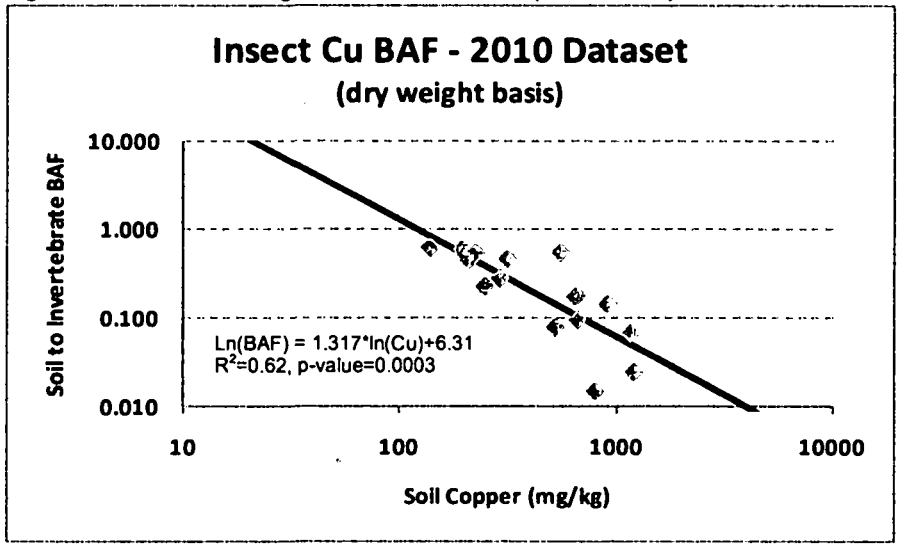
Notes:
Based on unwashed insect data. (Reproduction of Figure 1 from the April 2010 Formation Technical Memorandum)

Figure 7. Insect Cu BAF regression with 2010 data (washed insects).



Notes:
Based on washed insect data not corrected for ash content.

Figure 8. Insect Cu BAF regression with 2010 data (AFDW basis).



Notes:
Based on AFDW @ <2mm soil Copper, site 17 excluded

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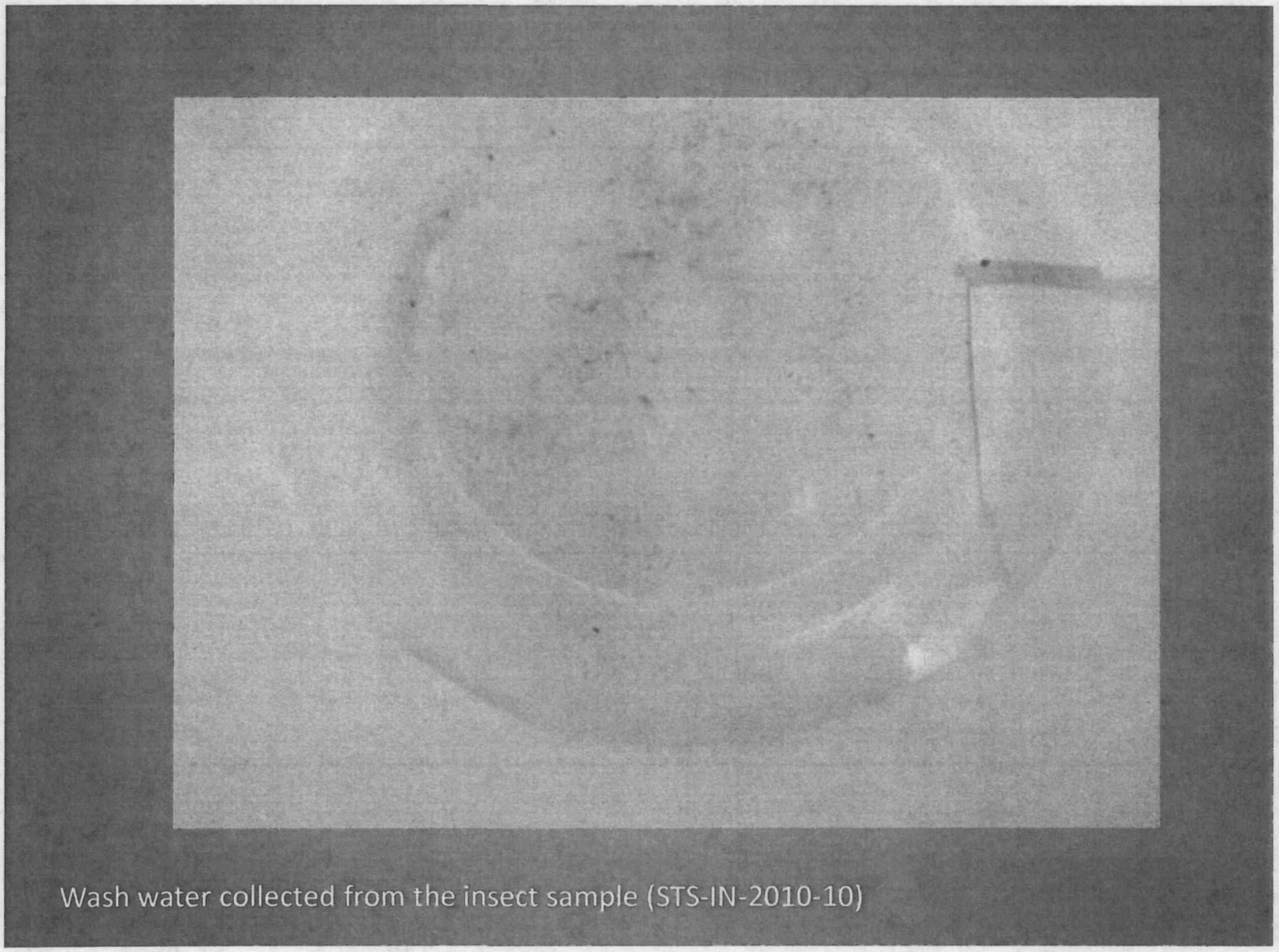
Appendix A

Insect Washing Station and Sample Prep Photos

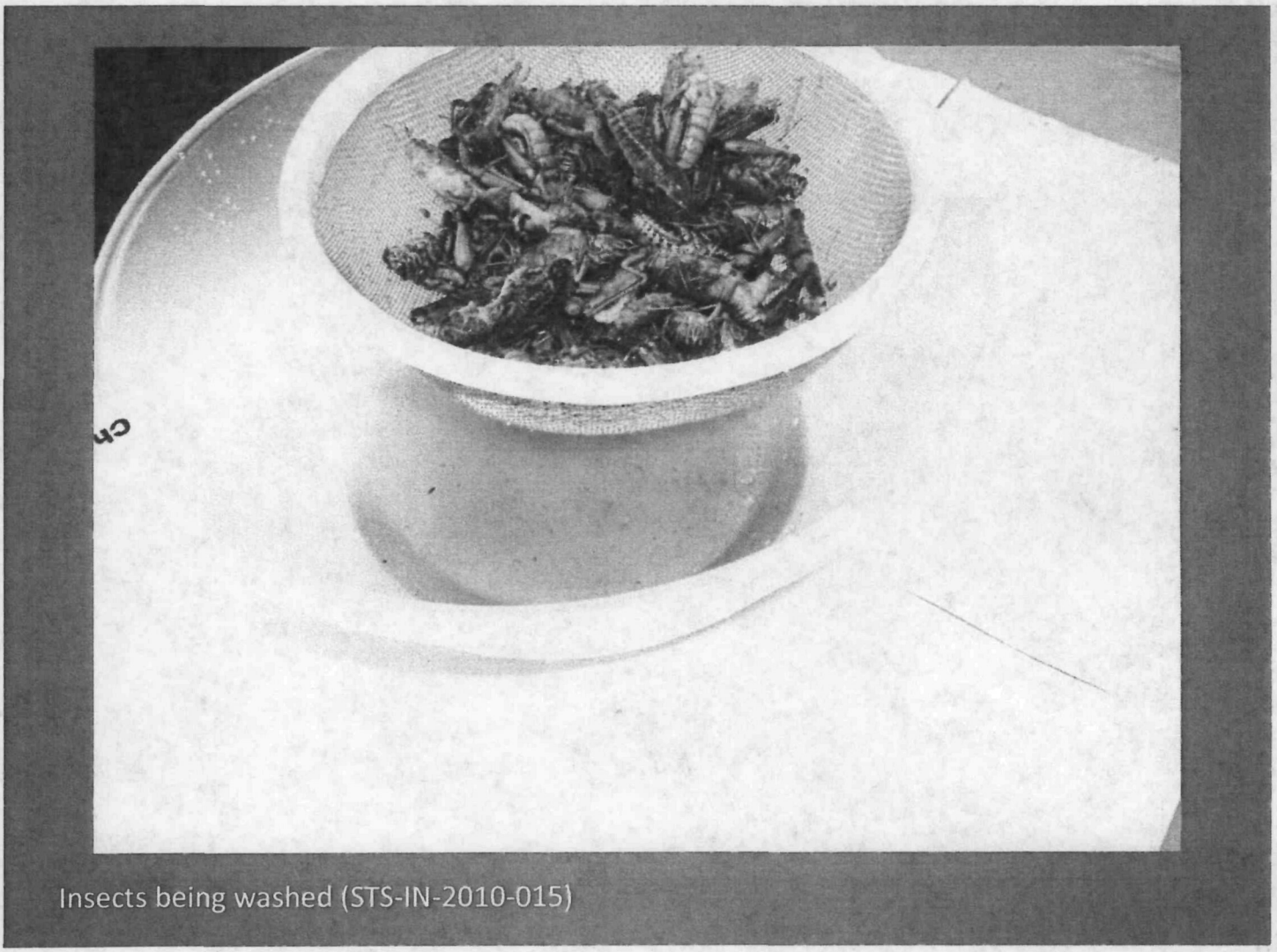
Picture of Insects collected from the field, before washing

Insects being sorted and counted (STS-IN-2010-13)

Insects being washed (STS-IN-2010-010)



Wash water collected from the insect sample (STS-IN-2010-10)



Insects being washed (STS-IN-2010-015)

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Appendix B

Laboratory Results

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

October 25, 2010

Report to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
PO Box 10
Bayard, NM 88023

Bill to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

cc: Anne Thatcher

Project ID: ZN01CC
ACZ Project ID: L84530

Pam Pinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 17, 2010. This project has been assigned to ACZ's project number, L84530. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L84530. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after November 25, 2010. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Freeport-McMoRan - Chino Mines Company

October 25, 2010

Project ID: ZN01CC
ACZ Project ID: L84530

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 5 animal tissue samples from Freeport-McMoRan - Chino Mines Company on September 17, 2010. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L84530. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. The Invitro Bioaccessibility Assay results have been qualified with the N1 flag on the extended qualifier report. The chemist noted that the Standard Operating Procedure for the method had been modified as following: 1. Extraction fluid pH of 2.6 units. 2. Extraction temperature to 42 C. 3. 0.7 g of pepsin added to all vessels before extraction.

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-002

ACZ Sample ID: ***L84530-01***
Date Sampled: *09/08/10 13:55*
Date Received: *09/17/10*
Sample Matrix: *Animal Tissue*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper (IVBA)	M6020 ICP-MS	0.335		*	mg/L	0.005	0.03	10/21/10 9:29	msh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
In Vitro Bioaccessibility Assay	EPA 9200.1-86			*				10/07/10 11:00	brd

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-004

ACZ Sample ID: ***L84530-02***
Date Sampled: *09/10/10 09:30*
Date Received: *09/17/10*
Sample Matrix: *Animal Tissue*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper (IVBA)	M6020 ICP-MS	0.170		*	mg/L	0.005	0.03	10/21/10 9:35	msh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
In Vitro Bioaccessibility Assay	EPA 9200.1-86			*				10/07/10 11:00	brd

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-005

ACZ Sample ID: ***L84530-03***
Date Sampled: *09/10/10 09:30*
Date Received: *09/17/10*
Sample Matrix: *Animal Tissue*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper (IVBA)	M6020 ICP-MS	0.142		*	mg/L	0.005	0.03	10/21/10 9:37	msh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
In Vitro Bioaccessibility Assay	EPA 9200.1-86			*				10/07/10 11:00	brd

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-010

ACZ Sample ID: ***L84530-04***
Date Sampled: *09/11/10 12:00*
Date Received: *09/17/10*
Sample Matrix: *Animal Tissue*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper (IVBA)	M6020 ICP-MS	0.242		*	mg/L	0.005	0.03	10/21/10 9:44	msh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
In Vitro Bioaccessibility Assay	EPA 9200.1-86			*				10/07/10 11:00	brd

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-014

ACZ Sample ID: ***L84530-05***
Date Sampled: *09/08/10 11:25*
Date Received: *09/17/10*
Sample Matrix: *Animal Tissue*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper (IVBA)	M6020 ICP-MS	0.177		*	mg/L	0.005	0.03	10/21/10 9:46	msh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
In Vitro Bioaccessibility Assay	EPA 9200.1-86			*				10/07/10 11:00	brd

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5) EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6) Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84530***

Project ID: ZN01CC

Copper (IVBA) M6020 ICP-MS

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG291533													
WG291533ICV	ICV	10/21/10 9:15	MS100812-2	.05		.0514	mg/L	102.8	90	110			
WG291533ICB	ICB	10/21/10 9:17				U	mg/L		-0.0015	0.0015			
WG291034PBS	PBS	10/21/10 9:25				U	mg/Kg		-0.015	0.015			
WG291034LFB	LFB	10/21/10 9:27	MS100908-3	.05005		.04689	mg/L	93.7	80	120			
L84530-01MS	MS	10/21/10 9:31	MS101021-2	1.001	.335	1.16	mg/Kg	82.4	75	125			
L84530-01MSD	MSD	10/21/10 9:33	MS101021-2	1.001	.335	1.36	mg/Kg	102.4	75	125	15.87	20	
L84530-05DUP	DUP	10/21/10 9:48			.177	.1544	mg/Kg				13.6	20	

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Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84530***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84530-01	WG291533	Copper (IVBA)	M6020 ICP-MS	ZB	The ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 100 times the MDL.
	WG291034	In Vitro Bioaccessibility Assay	EPA 9200.1-86	N1	See Case Narrative.
L84530-02	WG291533	Copper (IVBA)	M6020 ICP-MS	ZB	The ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 100 times the MDL.
	WG291034	In Vitro Bioaccessibility Assay	EPA 9200.1-86	N1	See Case Narrative.
L84530-03	WG291533	Copper (IVBA)	M6020 ICP-MS	ZB	The ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 100 times the MDL.
	WG291034	In Vitro Bioaccessibility Assay	EPA 9200.1-86	N1	See Case Narrative.
L84530-04	WG291533	Copper (IVBA)	M6020 ICP-MS	ZB	The ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 100 times the MDL.
	WG291034	In Vitro Bioaccessibility Assay	EPA 9200.1-86	N1	See Case Narrative.
L84530-05	WG291533	Copper (IVBA)	M6020 ICP-MS	ZB	The ICP-MS Serial Dilution was not used for data validation because the sample concentration was less than 100 times the MDL.
	WG291034	In Vitro Bioaccessibility Assay	EPA 9200.1-86	N1	See Case Narrative.

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Certification Qualifiers

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84530***

Metals Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Copper (IVBA)	M6020 ICP-MS

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Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84530
Date Received: 09/17/2010 16:24
Received By: gac
Date Printed: 9/29/2010

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Are the trip blanks (VOA and/or Cyanide) present?			X
12) Are samples requiring no headspace, headspace free?			X
13) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id		Temp (°C)	Rad (µR/hr)
NA11641		15.7	20

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
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Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84530
Date Received: 09/17/2010 16:24
Received By: gac
Date Printed: 9/29/2010

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L84530-01	STS-IN-2010-002									X		☐
L84530-02	STS-IN-2010-004									X		☐
L84530-03	STS-IN-2010-005									X		☐
L84530-04	STS-IN-2010-010									X		☐
L84530-05	STS-IN-2010-014									X		☐

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: gac

L84530

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

L84545 rec'd 9-22-10

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [x] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [x]

If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:

Project/PO #: ZN01CC

Reporting state for compliance testing:

Sampler's Name: Carolyn Meyer

Are any samples NRC licensable material? Yes No

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Total copper (3050)	Moisture content	Percent solids	Total volatile solids	In vitro (see notes)			
STS-IN-2010-002	9-8-2010, 1:55pm	Invert	1	x	x	x	x	x			
STS-IN-2010-003	9-8-2010, 3pm	Invert	1	x	x	x	x				
STS-IN-2010-004	9-10-2010, 9:30am	Invert	1	x	x	x	x	x			
STS-IN-2010-005	9-10-2010, 9:30am	Invert	1	x	x	x	x	x			
STS-IN-2010-006	9-10-2010, 1pm	Invert	1	x	x	x	x				
STS-IN-2010-007	9-9-2010, 9am	Invert	1	x	x	x	x				
STS-IN-2010-008	9-8-2010, 4:40pm	Invert	1	x	x	x	x				
STS-IN-2010-009	9-11-2010, 1:40pm	Invert	1	x	x	x	x				
STS-IN-2010-010	9-11-2010, 12pm	Invert	1	x	x	x	x	x			
STS-IN-2010-011	9-11-2010, 10am	Invert	1	x	x	x	x				

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Homogenize samples VERY THOROUGHLY before subsampling. Samples very heterogeneous. It will be easier to chop bugs up when frozen rather than thawed.

In vitro: leaching extraction and copper on extracted fluid (ICP-MS) requested following SBRC SOP #1 with pH mod of 2.6, temp mod of 42C, and add 0.7 g pepsin.

ARCADIS project ID: B0063543.0000

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
	9-17-2010, 12pm	KBS	9/17/10 4:15

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc. L84530

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ✘ / NO
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES / If yes, please include state forms. Results will be reported to PQL. NO ✘

PROJECT INFORMATION

Quote #:
Project/PO #: ENOICC
Reporting state for compliance testing:
Sampler's Name: Carolyn Meyer
Are any samples NRC licensable material? Yes No

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Total copper (3050)	Moisture content	Percent solids	Total volatile solids	In vitro (see notes)			
STS-IN-2010-012	9-10-2010, 5:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-013	9-10-2010, 8pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-014	9-8-2010, 11:25am	Invert	1	✘	✘	✘	✘	✘			
STS-IN-2010-015	9-8-2010, 9:30am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-016	9-9-2010, 4:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-017	9-9-2010, 4am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-018	9-9-2010, 1:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-019	9-8-2010, 9am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-020	9-10-2010, 5pm	Invert	1	✘	✘	✘	✘				

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Homogenize samples VERY THOROUGHLY before subsampling. Samples very heterogeneous. It will be easier to chop bugs up when frozen rather than thawed.
In vitro: leaching extraction and copper on extracted fluid (ICP-MS) requested following SBRC SOP #1 with pH mod of 2.6, temp mod of 42C, and add 0.7 g pepsin.
ARCADIS project ID: B0063543.0000

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
	9-17-2010 12pm	KBJ	9/17/10 4:15
		MC 9-21-10	16:20

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

October 04, 2010

Report to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
PO Box 10
Bayard, NM 88023

Bill to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

cc: Anne Thatcher

Project ID: ZN01CC
ACZ Project ID: L84453

Pam Pinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 17, 2010. This project has been assigned to ACZ's project number, L84453. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L84453. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after November 04, 2010. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-002

ACZ Sample ID: ***L84453-01***
Date Sampled: *09/08/10 13:55*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	48.5		*	mg/Kg	0.4	2	09/30/10 23:19	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	72.4		*	%	0.1	0.5	09/29/10 18:18	brd
Solids, Percent	CLPSOW390, PART F, D-98	27.6		*	%	0.1	0.5	09/29/10 18:18	brd
Total Volatile Solids	M2540G, Gravimetric	94.70		*	%	0.01	0.1	09/29/10 18:18	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:00	›su/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 12:07	brd/nrc

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-003

ACZ Sample ID: ***L84453-02***
Date Sampled: *09/08/10 15:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	40.7		*	mg/Kg	0.4	2	09/30/10 23:28	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	63.2		*	%	0.1	0.5	09/29/10 20:36	brd
Solids, Percent	CLPSOW390, PART F, D-98	36.8		*	%	0.1	0.5	09/29/10 20:36	brd
Total Volatile Solids	M2540G, Gravimetric	92.40		*	%	0.01	0.1	09/29/10 20:36	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:06	›su/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 15:15	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-004

ACZ Sample ID: ***L84453-03***
Date Sampled: *09/10/10 09:30*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	29.6		*	mg/Kg	0.4	2	09/30/10 23:31	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	67.8		*	%	0.1	0.5	09/29/10 22:54	brd
Solids, Percent	CLPSOW390, PART F, D-98	32.2		*	%	0.1	0.5	09/29/10 22:54	brd
Total Volatile Solids	M2540G, Gravimetric	89.80		*	%	0.01	0.1	09/29/10 22:54	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:13	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 16:18	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-005

ACZ Sample ID: ***L84453-04***
Date Sampled: *09/10/10 09:30*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	21.9		*	mg/Kg	0.4	2	09/30/10 23:37	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	70.5		*	%	0.1	0.5	09/30/10 1:12	brd
Solids, Percent	CLPSOW390, PART F, D-98	29.5		*	%	0.1	0.5	09/30/10 1:12	brd
Total Volatile Solids	M2540G, Gravimetric	90.90		*	%	0.01	0.1	09/30/10 1:12	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:20	›su/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 17:20	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-006

ACZ Sample ID: ***L84453-05***
Date Sampled: *09/10/10 13:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	55.7		*	mg/Kg	0.4	2	09/30/10 23:47	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	65.8		*	%	0.1	0.5	09/30/10 3:30	brd
Solids, Percent	CLPSOW390, PART F, D-98	34.3		*	%	0.1	0.5	09/30/10 3:30	brd
Total Volatile Solids	M2540G, Gravimetric	91.20		*	%	0.01	0.1	09/30/10 3:30	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:26	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 18:23	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-007

ACZ Sample ID: ***L84453-06***
Date Sampled: *09/09/10 09:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	16.9		*	mg/Kg	0.4	2	09/30/10 23:50	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	75.3		*	%	0.1	0.5	09/30/10 5:48	brd
Solids, Percent	CLPSOW390, PART F, D-98	24.7		*	%	0.1	0.5	09/30/10 5:48	brd
Total Volatile Solids	M2540G, Gravimetric	93.10		*	%	0.01	0.1	09/30/10 5:48	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:33	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 19:26	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-008

ACZ Sample ID: ***L84453-07***
Date Sampled: *09/08/10 16:40*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	46.4		*	mg/Kg	0.4	2	09/30/10 23:53	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	71.4		*	%	0.1	0.5	09/30/10 8:06	brd
Solids, Percent	CLPSOW390, PART F, D-98	28.6		*	%	0.1	0.5	09/30/10 8:06	brd
Total Volatile Solids	M2540G, Gravimetric	92.10		*	%	0.01	0.1	09/30/10 8:06	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:40	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 20:28	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-009

ACZ Sample ID: ***L84453-08***
Date Sampled: *09/11/10 13:40*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	41.9		*	mg/Kg	0.4	2	09/30/10 23:56	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	72.9		*	%	0.1	0.5	09/30/10 10:24	brd
Solids, Percent	CLPSOW390, PART F, D-98	27.1		*	%	0.1	0.5	09/30/10 10:24	brd
Total Volatile Solids	M2540G, Gravimetric	94.60		*	%	0.01	0.1	09/30/10 10:24	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:46	jsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 21:31	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-010

ACZ Sample ID: ***L84453-09***
Date Sampled: *09/11/10 12:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	28.5		*	mg/Kg	0.4	2	09/30/10 23:59	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	71.6		*	%	0.1	0.5	09/30/10 12:42	brd
Solids, Percent	CLPSOW390, PART F, D-98	28.4		*	%	0.1	0.5	09/30/10 12:42	brd
Total Volatile Solids	M2540G, Gravimetric	94.20		*	%	0.01	0.1	09/30/10 12:42	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 16:53	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 22:34	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-011

ACZ Sample ID: ***L84453-10***
Date Sampled: *09/11/10 10:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	27.5		*	mg/Kg	0.3	2	10/01/10 0:02	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	71.1		*	%	0.1	0.5	09/30/10 15:00	brd
Solids, Percent	CLPSOW390, PART F, D-98	28.9		*	%	0.1	0.5	09/30/10 15:00	brd
Total Volatile Solids	M2540G, Gravimetric	93.70		*	%	0.01	0.1	09/30/10 15:00	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:00	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/29/10 23:36	brd/nrc

** Please refer to Qualifier Reports for details.*

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-012

ACZ Sample ID: ***L84453-11***
Date Sampled: *09/10/10 17:45*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	28.2		*	mg/Kg	0.4	2	10/01/10 0:05	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	73.3		*	%	0.1	0.5	09/30/10 17:18	brd
Solids, Percent	CLPSOW390, PART F, D-98	26.7		*	%	0.1	0.5	09/30/10 17:18	brd
Total Volatile Solids	M2540G, Gravimetric	91.30		*	%	0.01	0.1	09/30/10 17:18	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:06	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 0:39	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-013

ACZ Sample ID: ***L84453-12***
Date Sampled: *09/10/10 20:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	33.5		*	mg/Kg	0.5	2	10/01/10 0:08	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	71.0		*	%	0.1	0.5	09/30/10 19:36	brd
Solids, Percent	CLPSOW390, PART F, D-98	29.0		*	%	0.1	0.5	09/30/10 19:36	brd
Total Volatile Solids	M2540G, Gravimetric	96.40		*	%	0.01	0.1	09/30/10 19:36	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:13	›su/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 1:41	brd/nrc

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-014

ACZ Sample ID: ***L84453-13***
Date Sampled: *09/08/10 11:25*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	19.5		*	mg/Kg	0.4	2	10/01/10 0:11	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	77.7		*	%	0.1	0.5	09/30/10 21:54	brd
Solids, Percent	CLPSOW390, PART F, D-98	22.3		*	%	0.1	0.5	09/30/10 21:54	brd
Total Volatile Solids	M2540G, Gravimetric	97.50		*	%	0.01	0.1	09/30/10 21:54	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:20	su/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 2:44	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-015

ACZ Sample ID: ***L84453-14***
Date Sampled: *09/08/10 09:30*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	101		*	mg/Kg	0.3	1	10/01/10 0:14	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	71.4		*	%	0.1	0.5	10/01/10 0:12	brd
Solids, Percent	CLPSOW390, PART F, D-98	28.6		*	%	0.1	0.5	10/01/10 0:12	brd
Total Volatile Solids	M2540G, Gravimetric	94.20		*	%	0.01	0.1	10/01/10 0:12	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:26	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 3:47	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-016

ACZ Sample ID: ***L84453-15***
Date Sampled: *09/09/10 16:45*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	39.8		*	mg/Kg	0.5	2	10/01/10 0:23	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	61.1		*	%	0.1	0.5	10/01/10 2:30	brd
Solids, Percent	CLPSOW390, PART F, D-98	38.9		*	%	0.1	0.5	10/01/10 2:30	brd
Total Volatile Solids	M2540G, Gravimetric	94.10		*	%	0.01	0.1	10/01/10 2:30	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:33	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 4:49	brd/nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-017

ACZ Sample ID: ***L84453-16***
Date Sampled: *09/09/10 04:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	17.5		*	mg/Kg	0.4	2	10/01/10 0:26	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	70.7		*	%	0.1	0.5	10/01/10 4:48	brd
Solids, Percent	CLPSOW390, PART F, D-98	29.3		*	%	0.1	0.5	10/01/10 4:48	brd
Total Volatile Solids	M2540G, Gravimetric	91.90		*	%	0.01	0.1	10/01/10 4:48	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:40	su/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 5:52	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-018

ACZ Sample ID: ***L84453-17***
Date Sampled: *09/09/10 13:45*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	34.3		*	mg/Kg	0.5	2	10/01/10 0:29	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	74.9		*	%	0.1	0.5	10/01/10 7:06	brd
Solids, Percent	CLPSOW390, PART F, D-98	25.1		*	%	0.1	0.5	10/01/10 7:06	brd
Total Volatile Solids	M2540G, Gravimetric	94.70		*	%	0.01	0.1	10/01/10 7:06	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:46	›su/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 6:54	brd/nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-019

ACZ Sample ID: ***L84453-18***
Date Sampled: *09/08/10 09:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	83.4		*	mg/Kg	0.4	2	10/01/10 0:32	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	70.5		*	%	0.1	0.5	10/01/10 9:24	brd
Solids, Percent	CLPSOW390, PART F, D-98	29.5		*	%	0.1	0.5	10/01/10 9:24	brd
Total Volatile Solids	M2540G, Gravimetric	94.60		*	%	0.01	0.1	10/01/10 9:24	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 17:53	ɔsu/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 7:57	brd/nrc

** Please refer to Qualifier Reports for details.*

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-020

ACZ Sample ID: ***L84453-19***
Date Sampled: *09/10/10 17:00*
Date Received: *09/17/10*
Sample Matrix: *Miscellaneous*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	40.0		*	mg/Kg	0.4	2	10/01/10 0:35	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Moisture Content	M209F, Gravimetric - 105 C	73.0		*	%	0.1	0.5	10/01/10 11:42	brd
Solids, Percent	CLPSOW390, PART F, D-98	27.0		*	%	0.1	0.5	10/01/10 11:42	brd
Total Volatile Solids	M2540G, Gravimetric	96.20		*	%	0.01	0.1	10/01/10 11:42	brd

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Animal Tissue Pulverization	M600/4-81-055							09/22/10 18:00	su/zsh
Digestion - Hot Plate	M3050B ICP							09/30/10 9:00	brd/nrc

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5) EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6) Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84453***

Project ID: ZN01CC

Copper, total (3050) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290684													
WG290684ICV	ICV	09/30/10 22:55	II100817-3	2		1.937	mg/L	96.9	90	110			
WG290684ICB	ICB	09/30/10 22:58				U	mg/L		-0.03	0.03			
WG290556PBS	PBS	09/30/10 23:10				U	mg/Kg		-3	3			
WG290556LCSS	LCSS	09/30/10 23:13	PCN34836	110		118.7	mg/Kg		91.2	128			
WG290556LCSSD	LCSSD	09/30/10 23:16	PCN34836	110		107.9	mg/Kg		91.2	128	9.5	20	
L84453-01MS	MS	09/30/10 23:22	II100924-2	22	48.5	62.63	mg/Kg	64.2	75	125			MC
L84453-01MSD	MSD	09/30/10 23:25	II100924-2	22	48.5	76.34	mg/Kg	126.5	75	125	19.73	20	MC

Moisture Content M209F, Gravimetric - 105 C

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290625													
WG290625PBS	PBS	09/29/10 16:00				100	%		99.9	100.1			
L84453-19DUP	DUP	10/01/10 14:00			73	72.92	%				0.1	20	

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290625													
WG290625PBS	PBS	09/29/10 16:00				U	%		99.9	100.1			
L84453-19DUP	DUP	10/01/10 14:00			27	27.08	%				0.3	20	

Total Volatile Solids M2540G, Gravimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290626													
WG290626PBS	PBS	09/29/10 16:00				U	%						
L84453-19DUP	DUP	10/01/10 14:00			96.2	83.269	%				14.4	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84453***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84453-01	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-02	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-03	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-04	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-05	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-06	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-07	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-08	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-09	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-10	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-11	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-12	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-13	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-14	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-15	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-16	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-17	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.
L84453-18	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company

ACZ Project ID: ***L84453***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84453-19	WG290684	Copper, total (3050)	M6010B ICP	MC	Recovery for matrix spike and matrix spike duplicate are outside of acceptance limits; recovery for the method control sample was acceptable.

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Moisture Content	M209F, Gravimetric - 105 C
Solids, Percent	CLPSOW390, PART F, D-98
Total Volatile Solids	M2540G, Gravimetric

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84453
Date Received: 09/17/2010 16:24
Received By: gac
Date Printed: 9/21/2010

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Are the trip blanks (VOA and/or Cyanide) present?			X
12) Are samples requiring no headspace, headspace free?			X
13) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id		Temp (°C)	Rad (µR/hr)
na11641		15.7	20

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84453
Date Received: 09/17/2010 16:24
Received By: gac
Date Printed: 9/21/2010

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L84453-01	STS-IN-2010-002									X		☐
L84453-02	STS-IN-2010-003									X		☐
L84453-03	STS-IN-2010-004									X		☐
L84453-04	STS-IN-2010-005									X		☐
L84453-05	STS-IN-2010-006									X		☐
L84453-06	STS-IN-2010-007									X		☐
L84453-07	STS-IN-2010-008									X		☐
L84453-08	STS-IN-2010-009									X		☐
L84453-09	STS-IN-2010-010									X		☐
L84453-10	STS-IN-2010-011									X		☐
L84453-11	STS-IN-2010-012									X		☐
L84453-12	STS-IN-2010-013									X		☐
L84453-13	STS-IN-2010-014									X		☐
L84453-14	STS-IN-2010-015									X		☐
L84453-15	STS-IN-2010-016									X		☐
L84453-16	STS-IN-2010-017									X		☐
L84453-17	STS-IN-2010-018									X		☐
L84453-18	STS-IN-2010-019									X		☐
L84453-19	STS-IN-2010-020									X		☐

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: gac

ACZ Laboratories, Inc. 184453

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [x] NO [ ]
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [x]
If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:
Project/PO #: ENoICC
Reporting state for compliance testing:
Sampler's Name: Carolyn Meyer
Are any samples NRC licensable material? Yes No

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Total copper (3050)	Moisture content	Percent solids	Total volatile solids	In vitro (see notes)			
STS-IN-2010-002	9-8-2010, 1:55pm	Invert	1	x	x	x	x	x			
STS-IN-2010-003	9-8-2010, 3pm	Invert	1	x	x	x	x				
STS-IN-2010-004	9-10-2010, 9:30am	Invert	1	x	x	x	x	x			
STS-IN-2010-005	9-10-2010, 9:30am	Invert	1	x	x	x	x	x			
STS-IN-2010-006	9-10-2010, 1pm	Invert	1	x	x	x	x				
STS-IN-2010-007	9-9-2010, 9am	Invert	1	x	x	x	x				
STS-IN-2010-008	9-8-2010, 4:40pm	Invert	1	x	x	x	x				
STS-IN-2010-009	9-11-2010, 1:40pm	Invert	1	x	x	x	x				
STS-IN-2010-010	9-11-2010, 12pm	Invert	1	x	x	x	x	x			
STS-IN-2010-011	9-11-2010, 10am	Invert	1	x	x	x	x				

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Homogenize samples VERY THOROUGHLY before subsampling. Samples very heterogeneous. It will be easier to chop bugs up when frozen rather than thawed.
In vitro: leaching extraction and copper on extracted fluid (ICP-MS) requested following SBRC SOP #1 with pH mod of 2.6, temp mod of 42C, and add 0.7 g pepsin.
ARCADIS project ID: B0063543.0000

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
	9-17-2010, 12pm	KBJ	9/17/10 4:15

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES ✘ NO
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES NO ✘
If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:
Project/PO #: ENDICC
Reporting state for compliance testing:
Sampler's Name: Carolyn Meyer
Are any samples NRC licensable material? Yes No

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Total copper (3050)	Moisture content	Percent solids	Total volatile solids	In vitro (see notes)			
STS-IN-2010-012	9-10-2010, 5:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-013	9-10-2010, 8pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-014	9-8-2010, 11:25am	Invert	1	✘	✘	✘	✘	✘			
STS-IN-2010-015	9-8-2010, 9:30am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-016	9-9-2010, 4:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-017	9-9-2010, 4am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-018	9-9-2010, 1:45pm	Invert	1	✘	✘	✘	✘				
STS-IN-2010-019	9-8-2010, 9am	Invert	1	✘	✘	✘	✘				
STS-IN-2010-020	9-10-2010, 5pm	Invert	1	✘	✘	✘	✘				

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

Homogenize samples VERY THOROUGHLY before subsampling. Samples very heterogeneous. It will be easier to chop bugs up when frozen rather than thawed.
In vitro: leaching extraction and copper on extracted fluid (ICP-MS) requested following SBRC SOP #1 with pH mod of 2.6, temp mod of 42C, and add 0.7 g pepsin.
ARCADIS project ID: B0063543.0000

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE:TIME	RECEIVED BY:	DATE:TIME
	9-17-2010 12pm	KBJ	9/17/10 4:15
		MJC 9-21-10	16:20

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-INVERT

Matrix: Miscellaneous 17 Invertebrate samples/ one time analysis-Total Cu. 10 day rush

Parameter	Method	Detection Limit	Cost/Sample
Metals Analysis			
Copper, total (3050)	M6010B ICP	0.01 mg/Kg	$13.50
Misc.			
Electronic Data Deliverable			$0.00
Quality Control Summary			$0.00
Setup charge for ICP, total			$27.00
Sample Preparation			
Animal Tissue Pulverization	M600/4-81-055		$45.00
Digestion - Hot Plate	M3050B ICP		$22.50
Soil Analysis			
Moisture Content	M209F, Gravimetric - 105 C	0.1 %	$10.50
Solids, Percent	CLPSOW390, PART F, D-98	0.1 %	$10.50
Total Volatile Solids	M2540G, Gravimetric	0.01 %	$19.50
		Cost/Sample:	**$148.50**

This quote is based on a 10 WORKING DAY RUSH. All projects received are subject to a $125.00 Minimum Charge. Soil preparation charges may fluctuate dependant on the condition of samples upon receipt. Please note that method detection limits are estimates and may be elevated depending on sample matrix.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-INVERT

Pricing includes shipment of all standard sample containers and related paperwork by UPS Ground Service. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting reqirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. Our general terms and conditions can be downloaded from our web site at http://www.acz.com/PDF/termsconditions.pdf. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of $200.00. Local orders without shipping are subject to a minimum charge of $125.00. Samples may incur a $10.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date) _____

Client Representative (Authorized signature and date) _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

October 04, 2010

Report to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
PO Box 10
Bayard, NM 88023

Bill to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

cc: Anne Thatcher

Project ID: ZN01CC
ACZ Project ID: L84452

Pam Pinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 17, 2010. This project has been assigned to ACZ's project number, L84452. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L84452. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after November 04, 2010. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-002-250

ACZ Sample ID: ***L84452-01***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	902		*	mg/Kg	1	5	09/30/10 21:20	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.9		*	%	0.1	0.5	09/29/10 15:18	nrc
Total Volatile Solids	M2540G, Gravimetric	4.82		*	%	0.01	0.1	09/29/10 15:18	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:30	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 9:57	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:00	nrc

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-003-250

ACZ Sample ID: ***L84452-02***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	956		*	mg/Kg	1	5	09/30/10 21:30	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.7		*	%	0.1	0.5	09/29/10 16:37	nrc
Total Volatile Solids	M2540G, Gravimetric	4.31		*	%	0.01	0.1	09/29/10 16:37	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:32	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 10:54	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:10	nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-004-250

ACZ Sample ID: ***L84452-03***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	753		*	mg/Kg	1	5	09/30/10 21:33	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	100		*	%	0.1	0.5	09/29/10 17:56	nrc
Total Volatile Solids	M2540G, Gravimetric	3.27		*	%	0.01	0.1	09/29/10 17:56	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:34	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 11:13	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:21	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-005-250

ACZ Sample ID: ***L84452-04***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	511		*	mg/Kg	1	5	09/30/10 21:36	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.8		*	%	0.1	0.5	09/29/10 19:15	nrc
Total Volatile Solids	M2540G, Gravimetric	3.54		*	%	0.01	0.1	09/29/10 19:15	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:36	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 11:32	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:31	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-006-250

ACZ Sample ID: ***L84452-05***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	837		*	mg/Kg	1	5	09/30/10 21:39	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.9		*	%	0.1	0.5	09/29/10 20:34	nrc
Total Volatile Solids	M2540G, Gravimetric	3.32		*	%	0.01	0.1	09/29/10 20:34	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:37	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 11:51	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:42	nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-007-250

ACZ Sample ID: ***L84452-06***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	816		*	mg/Kg	1	5	09/30/10 21:48	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.8		*	%	0.1	0.5	09/29/10 21:53	nrc
Total Volatile Solids	M2540G, Gravimetric	3.78		*	%	0.01	0.1	09/29/10 21:53	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:39	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 12:10	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 15:52	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-008-250

ACZ Sample ID: ***L84452-07***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	645		*	mg/Kg	1	5	09/30/10 21:54	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.9		*	%	0.1	0.5	09/29/10 23:12	nrc
Total Volatile Solids	M2540G, Gravimetric	3.32		*	%	0.01	0.1	09/29/10 23:12	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:41	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 12:29	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:03	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-009-250

ACZ Sample ID: ***L84452-08***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	431		*	mg/Kg	1	5	09/30/10 21:57	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	100		*	%	0.1	0.5	09/30/10 0:31	nrc
Total Volatile Solids	M2540G, Gravimetric	4.58		*	%	0.01	0.1	09/30/10 0:31	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:42	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 12:49	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:14	nrc

** Please refer to Qualifier Reports for details.*

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-010-250

ACZ Sample ID: ***L84452-09***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	432		*	mg/Kg	1	5	09/30/10 22:00	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.4		*	%	0.1	0.5	09/30/10 1:50	nrc
Total Volatile Solids	M2540G, Gravimetric	4.80		*	%	0.01	0.1	09/30/10 1:50	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:44	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 13:08	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:24	nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-011-250

ACZ Sample ID: ***L84452-10***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	393		*	mg/Kg	1	5	09/30/10 22:03	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.5		*	%	0.1	0.5	09/30/10 3:09	nrc
Total Volatile Solids	M2540G, Gravimetric	5.80		*	%	0.01	0.1	09/30/10 3:09	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:46	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 13:27	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:35	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-012-250

ACZ Sample ID: ***L84452-11***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	366		*	mg/Kg	1	5	09/30/10 22:06	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.4		*	%	0.1	0.5	09/30/10 4:28	nrc
Total Volatile Solids	M2540G, Gravimetric	5.09		*	%	0.01	0.1	09/30/10 4:28	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:48	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 13:46	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:45	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-013-250

ACZ Sample ID: ***L84452-12***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	485		*	mg/Kg	1	5	09/30/10 22:09	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.8		*	%	0.1	0.5	09/30/10 5:47	nrc
Total Volatile Solids	M2540G, Gravimetric	5.22		*	%	0.01	0.1	09/30/10 5:47	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:49	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 14:05	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 16:56	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-014-250

ACZ Sample ID: ***L84452-13***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	184		*	mg/Kg	1	5	09/30/10 22:12	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.3		*	%	0.1	0.5	09/30/10 7:06	nrc
Total Volatile Solids	M2540G, Gravimetric	6.25		*	%	0.01	0.1	09/30/10 7:06	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:51	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 14:24	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:07	nrc

** Please refer to Qualifier Reports for details.*

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-015-250

ACZ Sample ID: ***L84452-14***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	837		*	mg/Kg	1	5	09/30/10 22:15	aeh

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.6		*	%	0.1	0.5	09/30/10 8:25	nrc
Total Volatile Solids	M2540G, Gravimetric	6.33		*	%	0.01	0.1	09/30/10 8:25	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:53	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 14:43	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:17	nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-016-250

ACZ Sample ID: ***L84452-15***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	1790		*	mg/Kg	1	5	10/01/10 10:57	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.8		*	%	0.1	0.5	09/30/10 9:44	nrc
Total Volatile Solids	M2540G, Gravimetric	5.00		*	%	0.01	0.1	09/30/10 9:44	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:54	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 15:02	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:28	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-017-250

ACZ Sample ID: ***L84452-16***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	3080		*	mg/Kg	1	5	10/01/10 11:03	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.9		*	%	0.1	0.5	09/30/10 11:03	nrc
Total Volatile Solids	M2540G, Gravimetric	5.25		*	%	0.01	0.1	09/30/10 11:03	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:56	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 15:21	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:38	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-018-250

ACZ Sample ID: ***L84452-17***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	2420		*	mg/Kg	1	5	10/01/10 11:07	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.5		*	%	0.1	0.5	09/30/10 12:22	nrc
Total Volatile Solids	M2540G, Gravimetric	5.33		*	%	0.01	0.1	09/30/10 12:22	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:58	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 15:40	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:49	nrc

** Please refer to Qualifier Reports for details.*

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-DUP-250

ACZ Sample ID: ***L84452-18***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	730		*	mg/Kg	1	5	10/01/10 11:17	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Solids, Percent	CLPSOW390, PART F, D-98	99.7		*	%	0.1	0.5	09/30/10 13:41	nrc
Total Volatile Solids	M2540G, Gravimetric	3.21		*	%	0.01	0.1	09/30/10 13:41	nrc

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 15:00	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 15:59	nrc
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2			*				09/28/10 17:59	nrc

** Please refer to Qualifier Reports for details.*

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1) EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.

(2) EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.

(3) EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.

(5) EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.

(6) Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1) QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.

(2) Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.

(3) Animal matrices for Inorganic analyses are reported on an "as received" basis.

(4) An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84452***
Project ID: ZN01CC

Copper, total (3050) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290680													
WG290680ICV	ICV	09/30/10 20:56	II100817-3	2		1.929	mg/L	96.5	90	110			
WG290680ICB	ICB	09/30/10 20:59				U	mg/L		-0.03	0.03			
WG290554PBS	PBS	09/30/10 21:11				U	mg/Kg		-3	3			
WG290554LCSS	LCSS	09/30/10 21:14	PCN34836	110		134.6	mg/Kg		91.2	128			RL
WG290554LCSSD	LCSSD	09/30/10 21:17	PCN34836	110		113.7	mg/Kg		91.2	128	16.8	20	
L84452-01MS	MS	09/30/10 21:24	II100924-2	50	902	928.1	mg/Kg	52.2	75	125			M3
L84452-01MSD	MSD	09/30/10 21:27	II100924-2	50	902	954.7	mg/Kg	105.4	75	125	2.83	20	
WG290732													
WG290732ICV	ICV	10/01/10 10:20	II100817-3	2		1.96	mg/L	98	90	110			
WG290732ICB	ICB	10/01/10 10:23				U	mg/L		-0.03	0.03			
WG290554PBS	PBS	10/01/10 10:36				U	mg/Kg		-3	3			
WG290554LCSS	LCSS	10/01/10 10:40	PCN34836	110		133.6	mg/Kg		91.2	128			RL
WG290554LCSSD	LCSSD	10/01/10 10:43	PCN34836	110		110.8	mg/Kg		91.2	128	18.7	20	
L84452-01MS	MS	10/01/10 10:50	II100924-2	50	890	926.9	mg/Kg	73.8	75	125			M3
L84452-01MSD	MSD	10/01/10 10:53	II100924-2	50	890	943.5	mg/Kg	107	75	125	1.78	20	

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290623													
WG290623PBS	PBS	09/29/10 14:00				U	%		99.9	100.1			
L84452-18DUP	DUP	09/30/10 15:00			99.7	100	%				0.3	20	

Total Volatile Solids M2540G, Gravimetric

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290624													
WG290624PBS	PBS	09/29/10 14:00				U	%						
L84452-18DUP	DUP	09/30/10 15:00			3.21	3.331	%				3.7	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84452***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84452-01	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-02	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-03	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-04	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-05	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-06	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-07	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84452***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84452-08	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-09	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-10	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-11	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-12	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-13	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-14	WG290680	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84452***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84452-15	WG290732	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-16	WG290732	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-17	WG290732	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84452-18	WG290732	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
			M6010B ICP	RL	Recovery for either the LCS or LCS duplicate was outside of the acceptance limits; the RPD was within the acceptance limits.
	WG290518	Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2	N1	See Case Narrative.

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

Solids, Percent	CLPSOW390, PART F, D-98
Total Volatile Solids	M2540G, Gravimetric

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84452
Date Received: 09/17/2010 11:17
Received By: gac
Date Printed: 9/22/2010

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Is the trip blank for Cyanide present?			X
12) Is the trip blank for VOA present?			X
13) Are samples requiring no headspace, headspace free?			X
14) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

no sample date or time given on chain of custody or sample containers.

Contact (For any discrepancies, the client must be contacted)

The client was not contacted. used relinquished time and date.

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/hr)
na11636	17.2	28
na11635	18.6	19
na11637	18.3	22

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

Cross out on ID line 8 on Chain of Custody 2.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84452
Date Received: 09/17/2010 11:17
Received By: gac
Date Printed: 9/22/2010

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L84452-01	STS-SS-2010-002-250									X		☐
L84452-02	STS-SS-2010-003-250									X		☐
L84452-03	STS-SS-2010-004-250									X		☐
L84452-04	STS-SS-2010-005-250									X		☐
L84452-05	STS-SS-2010-006-250									X		☐
L84452-06	STS-SS-2010-007-250									X		☐
L84452-07	STS-SS-2010-008-250									X		☐
L84452-08	STS-SS-2010-009-250									X		☐
L84452-09	STS-SS-2010-010-250									X		☐
L84452-10	STS-SS-2010-011-250									X		☐
L84452-11	STS-SS-2010-012-250									X		☐
L84452-12	STS-SS-2010-013-250									X		☐
L84452-13	STS-SS-2010-014-250									X		☐
L84452-14	STS-SS-2010-015-250									X		☐
L84452-15	STS-SS-2010-016-250									X		☐
L84452-16	STS-SS-2010-017-250									X		☐
L84452-17	STS-SS-2010-018-250									X		☐
L84452-18	STS-SS-2010-DUP-250									X		☐

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Hydrochloric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: _____

U84452

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [X]
If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:
Project/PO #: Invoice
Reporting state for compliance testing:
Sampler's Name: Carolyn Meyer
Are any samples NRC licensable material? Yes (No)

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE/TIME	Matrix	# of Containers	Sieve-2000um	Total copper (3050)	total volatile solids	Paste pH	Sieve-250um			
STS-SS-2010-002		SO	1	X	X	X	X	X			
STS-SS-2010-003		SO	1	X	X	X	X	X			
STS-SS-2010-004		SO	1	X	X	X	X	X			
STS-SS-2010-005		SO	1	X	X	X	X	X			
STS-SS-2010-006		SO	1	X	X	X	X	X			
STS-SS-2010-007		SO	1	X	X	X	X	X			
STS-SS-2010-008		SO	1	X	X	X	X	X			
STS-SS-2010-009		SO	1	X	X	X	X	X			
STS-SS-2010-010		SO	1	X	X	X	X	X			
STS-SS-2010-011		SO	1	X	X	X	X	X			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

COPY

REMARKS

One split of each soil sample should be sieved to <2mm and analyzed for total Cu and paste pH. A second split of each soil sample should be sieved to <250um and analyzed for total Cu and total volatile solids.

ARCADIS project ID: B0063543.0000 Task 26

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY	DATE:TIME	RECEIVED BY	DATE:TIME
BARRY FULTON	9/15/2010 12:00PM		
		9/21/10	11:10

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

COC 452

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [X]

If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:

Project/PO #: 2N01CC

Reporting state for compliance testing:

Sampler's Name: Carolyn Meyer

Are any samples NRC licensable material? Yes (No)

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE/TIME	Matrix	# of Containers	Sieve-2000um	Total copper (3050)	total volatile solids	Paste pH	Sieve-250um			
STS-SS-2010-012		SO	1	X	X	X	X	X			
STS-SS-2010-013		SO	1	X	X	X	X	X			
STS-SS-2010-014		SO	1	X	X	X	X	X			
STS-SS-2010-015		SO	1	X	X	X	X	X			
STS-SS-2010-016		SO	1	X	X	X	X	X			
STS-SS-2010-017		SO	1	X	X	X	X	X			
STS-SS-2010-018		SO	1	X	X	X	X	X			
STS-SS-2010-~~019~~ WP		SO	1	X	X	X	X	X			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

Copy

REMARKS

One split of each soil sample should be sieved to <2mm and analyzed for total Cu and paste pH. A second split of each soil sample should be sieved to <250um and analyzed for total Cu and total volatile solids.

ARCADIS project ID: B0063543.0000 Task 26

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	DATE/TIME
BARRY FULTON	9/15/2010		
		[illegible] 9-20-10	11:10

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-SOIL-250UM

Matrix: Soil — 34 samples/ one time analysis- Total Cu. 10 DAY RUSH

Parameter	Method	Detection Limit	Cost/Sample
Metals Analysis			
Copper, total (3050)	M6010B ICP	1 mg/Kg	$13.50
Misc.			
Electronic Data Deliverable			$0.00
Quality Control Summary			$0.00
Setup charge for ICP, total			$27.00
Sample Preparation			
Air Dry at 34 Degrees C	USDA No. 1, 1972		$10.50
Digestion - Hot Plate	M3050B ICP		$22.50
Sieve-250 um (60 mesh)	ASA No.9, 15-4.2.2		$16.50
Soil Analysis			
Solids, Percent	CLPSOW390, PART F, D-98	0.1 %	$10.50
Total Volatile Solids	M2540G, Gravimetric	0.01 %	$19.50
		Cost/Sample:	**$120.00**

This quote is based on a 10 working day rush Turn Around Time Soil preparation charges may fluctuate dependant on the condition of samples upon receipt. Please note that method detection limits are estimates and may be elevated depending on sample matrix.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-SOIL-250UM

Pricing includes shipment of all standard sample containers and related paperwork by UPS Ground Service. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting reqirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. Our general terms and conditions can be downloaded from our web site at http://www.acz.com/PDF/termsconditions.pdf. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of $200.00. Local orders without shipping are subject to a minimum charge of $125.00. Samples may incur a $10.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date) _____

Client Representative (Authorized signature and date) _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

October 04, 2010

Report to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
PO Box 10
Bayard, NM 88023

Bill to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

cc: Anne Thatcher

Project ID: ZN01CC
ACZ Project ID: L84451

Pam Pinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 17, 2010. This project has been assigned to ACZ's project number, L84451. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L84451. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after November 04, 2010. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

Freeport-McMoRan - Chino Mines Company

October 01, 2010

Project ID: ZN01CC
ACZ Project ID: L84451

Sample Receipt

ACZ Laboratories, Inc. (ACZ) received 18 soil samples from Freeport-McMoRan - Chino Mines Company on September 17, 2010. The samples were received in good condition. Upon receipt, the sample custodian removed the samples from the cooler, inspected the contents, and logged the samples into ACZ's computerized Laboratory Information Management System (LIMS). The samples were assigned ACZ LIMS project number L84451. The custodian verified the sample information entered into the computer against the chain of custody (COC) forms and sample bottle labels.

Holding Times

All analyses were performed within EPA recommended holding times.

Sample Analysis

These samples were analyzed for inorganic parameters. The individual methods are referenced on both, the ACZ invoice and the analytical reports. The extended qualifier reports may contain footnotes qualifying specific elements due to QC failures. In addition the following has been noted with this specific project:

1. The Sieve <2000 u data was qualified with the N1 flag on the extended qualifier report. The chemist noted this just to make note that the < 2000 was further sieved to < 250 and logged in as ACZ project L84452 for additional analysis.

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-002

ACZ Sample ID: ***L84451-01***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	860		*	mg/Kg	1	5	09/30/10 13:11	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.2		*	units	0.1	0.1	09/30/10 15:00	nrc
Solids, Percent	CLPSOW390, PART F, D-98	94.0		*	%	0.1	0.5	09/22/10 16:06	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:00	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 12:16	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 15:00	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:00	nrc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-003

ACZ Sample ID: ***L84451-02***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	625		*	mg/Kg	1	5	09/30/10 13:20	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.5		*	units	0.1	0.1	09/30/10 16:10	nrc
Solids, Percent	CLPSOW390, PART F, D-98	94.1		*	%	0.1	0.5	09/22/10 18:48	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:01	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 15:32	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 16:10	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:10	nrc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-004

ACZ Sample ID: ***L84451-03***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	486		*	mg/Kg	1	5	09/30/10 13:23	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.3		*	units	0.1	0.1	09/30/10 17:20	nrc
Solids, Percent	CLPSOW390, PART F, D-98	96.7		*	%	0.1	0.5	09/22/10 20:10	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:03	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 16:38	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 17:20	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:21	nrc

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-005

ACZ Sample ID: ***L84451-04***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	238		*	mg/Kg	1	5	09/30/10 13:29	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.4		*	units	0.1	0.1	09/30/10 18:30	nrc
Solids, Percent	CLPSOW390, PART F, D-98	96.2		*	%	0.1	0.5	09/22/10 21:31	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:05	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 17:43	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 18:30	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:31	nrc

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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-006

ACZ Sample ID: ***L84451-05***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	622		*	mg/Kg	1	5	09/30/10 13:38	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.3		*	units	0.1	0.1	09/30/10 19:40	nrc
Solids, Percent	CLPSOW390, PART F, D-98	95.7		*	%	0.1	0.5	09/22/10 22:52	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:06	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 18:49	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 19:40	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:42	nrc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-007

ACZ Sample ID: ***L84451-06***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	758		*	mg/Kg	1	5	09/30/10 13:41	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.7		*	units	0.1	0.1	09/30/10 20:50	nrc
Solids, Percent	CLPSOW390, PART F, D-98	94.4		*	%	0.1	0.5	09/23/10 0:14	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:08	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 19:54	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 20:50	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 15:52	nrc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-008

ACZ Sample ID: ***L84451-07***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	643		*	mg/Kg	1	5	09/30/10 13:44	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	7.0		*	units	0.1	0.1	09/30/10 22:00	nrc
Solids, Percent	CLPSOW390, PART F, D-98	97.3		*	%	0.1	0.5	09/23/10 1:35	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:10	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 20:59	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 22:00	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:03	nrc

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-009

ACZ Sample ID: ***L84451-08***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	291		*	mg/Kg	1	5	09/30/10 13:47	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	4.6		*	units	0.1	0.1	09/30/10 23:10	nrc
Solids, Percent	CLPSOW390, PART F, D-98	92.6		*	%	0.1	0.5	09/23/10 2:56	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:12	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 22:05	brd
Saturated Paste Extraction	USDA No. 60 (2)							09/30/10 23:10	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:14	nrc

** Please refer to Qualifier Reports for details.*

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-010

ACZ Sample ID: ***L84451-09***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	197		*	mg/Kg	1	5	09/30/10 13:50	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	5.4		*	units	0.1	0.1	10/01/10 0:20	nrc
Solids, Percent	CLPSOW390, PART F, D-98	94.2		*	%	0.1	0.5	09/23/10 4:18	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:13	brd
Digestion - Hot Plate	M3050B ICP							09/29/10 23:10	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 0:20	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:24	nrc

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-011

ACZ Sample ID: ***L84451-10***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	277		*	mg/Kg	1	5	09/30/10 13:53	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	7.0		*	units	0.1	0.1	10/01/10 1:30	nrc
Solids, Percent	CLPSOW390, PART F, D-98	95.5		*	%	0.1	0.5	09/23/10 5:39	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:15	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 0:16	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 1:30	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:35	nrc

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-012

ACZ Sample ID: ***L84451-11***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	215		*	mg/Kg	1	5	09/30/10 13:56	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	7.8		*	units	0.1	0.1	10/01/10 2:40	nrc
Solids, Percent	CLPSOW390, PART F, D-98	96.1		*	%	0.1	0.5	09/23/10 7:00	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:17	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 1:21	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 2:40	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:45	nrc

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-013

ACZ Sample ID: ***L84451-12***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	186		*	mg/Kg	1	5	09/30/10 13:59	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.3		*	units	0.1	0.1	10/01/10 3:50	nrc
Solids, Percent	CLPSOW390, PART F, D-98	96.5		*	%	0.1	0.5	09/23/10 8:22	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:18	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 2:27	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 3:50	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 16:56	nrc

** Please refer to Qualifier Reports for details.*

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-014

ACZ Sample ID: ***L84451-13***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	129		*	mg/Kg	1	5	09/30/10 14:02	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	7.5		*	units	0.1	0.1	10/01/10 5:00	nrc
Solids, Percent	CLPSOW390, PART F, D-98	93.4		*	%	0.1	0.5	09/23/10 9:43	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:20	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 3:32	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 5:00	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:07	nrc

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-015

ACZ Sample ID: ***L84451-14***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	529		*	mg/Kg	1	5	09/30/10 14:05	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	7.8		*	units	0.1	0.1	10/01/10 6:10	nrc
Solids, Percent	CLPSOW390, PART F, D-98	95.5		*	%	0.1	0.5	09/23/10 11:04	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:22	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 4:38	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 6:10	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:17	nrc

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2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-016

ACZ Sample ID: ***L84451-15***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	1120		*	mg/Kg	1	5	09/30/10 14:15	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	4.9		*	units	0.1	0.1	10/01/10 7:20	nrc
Solids, Percent	CLPSOW390, PART F, D-98	92.5		*	%	0.1	0.5	09/23/10 12:26	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:24	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 5:43	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 7:20	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:28	nrc

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-017

ACZ Sample ID: ***L84451-16***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	2060		*	mg/Kg	1	5	09/30/10 14:18	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.0		*	units	0.1	0.1	10/01/10 8:30	nrc
Solids, Percent	CLPSOW390, PART F, D-98	92.5		*	%	0.1	0.5	09/23/10 13:47	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:25	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 6:49	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 8:30	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:38	nrc

ACZ Laboratories, Inc.
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Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-018

ACZ Sample ID: ***L84451-17***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	1100		*	mg/Kg	1	5	09/30/10 14:21	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.0		*	units	0.1	0.1	10/01/10 9:40	nrc
Solids, Percent	CLPSOW390, PART F, D-98	94.7		*	%	0.1	0.5	09/23/10 15:08	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:27	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 7:54	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 9:40	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:49	nrc

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-SS-2010-DUP

ACZ Sample ID: ***L84451-18***
Date Sampled: *09/15/10 00:00*
Date Received: *09/17/10*
Sample Matrix: *Soil*

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total (3050)	M6010B ICP	530		*	mg/Kg	1	5	09/30/10 14:24	ear

Soil Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
pH, Saturated Paste	USDA No. 60 (21A)	6.3		*	units	0.1	0.1	10/01/10 10:50	nrc
Solids, Percent	CLPSOW390, PART F, D-98	96.6		*	%	0.1	0.5	09/23/10 16:30	zsh

Soil Preparation

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Air Dry at 34 Degrees C	USDA No. 1, 1972							09/22/10 14:29	brd
Digestion - Hot Plate	M3050B ICP							09/30/10 8:59	brd
Saturated Paste Extraction	USDA No. 60 (2)							10/01/10 10:50	nrc
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2			*				09/28/10 17:59	nrc

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84451***

Project ID: ZN01CC

Copper, total (3050) M6010B ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290669													
WG290669ICV	ICV	09/30/10 11:56	II100817-3	2		1.887	mg/L	94.4	90	110			
WG290669ICB	ICB	09/30/10 11:59				U	mg/L		-0.03	0.03			
WG290653													
WG290553PBS	PBS	09/30/10 13:01				U	mg/Kg		-3	3			
WG290553LCSS	LCSS	09/30/10 13:05	PCN34836	110		101.1	mg/Kg		91.2	128			
WG290553LCSSD	LCSSD	09/30/10 13:08	PCN34836	110		105.4	mg/Kg		91.2	128	4.2	20	
L84451-01MS	MS	09/30/10 13:14	II100924-2	50	860	863.3	mg/Kg	6.6	75	125			M3
L84451-01MSD	MSD	09/30/10 13:17	II100924-2	50	860	872.8	mg/Kg	25.6	75	125	1.09	20	M3

pH, Saturated Paste USDA No. 60 (21A)

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290778													
L84451-18DUP	DUP	10/01/10 12:00			6.3	6.21	units				1.4	20	

Solids, Percent CLPSOW390, PART F, D-98

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290150													
WG290150PBS	PBS	09/22/10 14:45				U	%		99.9	100.1			
L84451-01DUP	DUP	09/22/10 17:27			94	93.86	%				0.1	20	

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84451***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84451-01	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-02	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-03	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-04	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-05	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-06	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-07	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-08	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-09	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-10	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-11	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84451***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION
L84451-12	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-13	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-14	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-15	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-16	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-17	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.
L84451-18	WG290653	Copper, total (3050)	M6010B ICP	M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The recovery of the associated control sample (LCS or LFB) was acceptable.
	WG290517	Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2	N1	See Case Narrative.

Soil Analysis

The following parameters are not offered for certification or are not covered by NELAC certificate #ACZ.

pH, Saturated Paste	USDA No. 60 (21A)
Solids, Percent	CLPSOW390, PART F, D-98

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84451
Date Received: 09/17/2010 11:17
Received By: gac
Date Printed: 9/22/2010

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Is the trip blank for Cyanide present?			X
12) Is the trip blank for VOA present?			X
13) Are samples requiring no headspace, headspace free?			X
14) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

No sample date or time given.

Contact (For any discrepancies, the client must be contacted)

The client was not contacted. Used relinquished date and time.

Shipping Containers

Cooler Id	Temp (°C)	Rad (µR/hr)
na11636	17.2	28
na11635	18.6	19
na11637	18.3	22

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

Cross out on ID line 8 on Chain of Custody 2.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
ZN01CC

ACZ Project ID: L84451
Date Received: 09/17/2010 11:17
Received By: gac
Date Printed: 9/22/2010

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L84451-01	STS-SS-2010-002									X		☐
L84451-02	STS-SS-2010-003									X		☐
L84451-03	STS-SS-2010-004									X		☐
L84451-04	STS-SS-2010-005									X		☐
L84451-05	STS-SS-2010-006									X		☐
L84451-06	STS-SS-2010-007									X		☐
L84451-07	STS-SS-2010-008									X		☐
L84451-08	STS-SS-2010-009									X		☐
L84451-09	STS-SS-2010-010									X		☐
L84451-10	STS-SS-2010-011									X		☐
L84451-11	STS-SS-2010-012									X		☐
L84451-12	STS-SS-2010-013									X		☐
L84451-13	STS-SS-2010-014									X		☐
L84451-14	STS-SS-2010-015									X		☐
L84451-15	STS-SS-2010-016									X		☐
L84451-16	STS-SS-2010-017									X		☐
L84451-17	STS-SS-2010-018									X		☐
L84451-18	STS-SS-2010-DUP									X		☐

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Hydrochloric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: _____

L84451

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [X] NO [ ]
If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [X]
If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:
Project/PO #: 2Nov10
Reporting state for compliance testing:
Sampler's Name: Carolyn Meyer
Are any samples NRC licensable material? Yes (No)

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE:TIME	Matrix	# of Containers	Sieve-2000um	Total copper (3050)	total volatile solids	Paste pH	Sieve-250um			
STS-SS-2010-002		SO	1	X	X	X	X	X			
STS-SS-2010-003		SO	1	X	X	X	X	X			
STS-SS-2010-004		SO	1	X	X	X	X	X			
STS-SS-2010-005		SO	1	X	X	X	X	X			
STS-SS-2010-006		SO	1	X	X	X	X	X			
STS-SS-2010-007		SO	1	X	X	X	X	X			
STS-SS-2010-008		SO	1	X	X	X	X	X			
STS-SS-2010-009		SO	1	X	X	X	X	X			
STS-SS-2010-010		SO	1	X	X	X	X	X			
STS-SS-2010-011		SO	1	X	X	X	X	X			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

One split of each soil sample should be sieved to <2mm and analyzed for total Cu and paste pH. A second split of each soil sample should be sieved to <250um and analyzed for total Cu and total volatile solids.

ARCADIS project ID: B0063543.0000 Task 26

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY	DATE:TIME	RECEIVED BY	DATE:TIME
BARRY FULTON	11/15/2010 12:00PM		
		[signature]	11-16-10

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to:

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [x] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [x]

If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:

Project/PO #: 20016c

Reporting state for compliance testing:

Sampler's Name: Carolyn Meyer

Are any samples NRC licensable material? Yes (No)

ANALYSES REQUESTED *(attach list or use quote number)*

SAMPLE IDENTIFICATION	DATE TIME	Matrix	# of Containers	Sieve-2000um	Total copper (3050)	total volatile solids	Paste pH	Sieve-250um			
STS-SS-2010-012		SO	1	x	x	x	x	x			
STS-SS-2010-013		SO	1	x	x	x	x	x			
STS-SS-2010-014		SO	1	x	x	x	x	x			
STS-SS-2010-015		SO	1	x	x	x	x	x			
STS-SS-2010-016		SO	1	x	x	x	x	x			
STS-SS-2010-017		SO	1	x	x	x	x	x			
STS-SS-2010-018		SO	1	x	x	x	x	x			
STS-SS-2010-~~019~~ QP		SO	1	x	x	x	x	x			

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

One split of each soil sample should be sieved to <2mm and analyzed for total Cu and paste pH. A second split of each soil sample should be sieved to <250um and analyzed for total Cu and total volatile solids.

ARCADIS project ID: B0063543.0000 Task 26

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE: TIME	RECEIVED BY:	DATE: TIME
Barry Fulton	9/13/2010		
			9/14/10 11:10

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-SOIL

Matrix: Soil — 34 samples/ one time analysis- Total Cu. 10 DAY RUSH

Parameter	Method	Detection Limit	Cost/Sample
Metals Analysis			
Copper, total (3050)	M6010B ICP	1 mg/Kg	$13.50
Misc.			
Electronic Data Deliverable			$0.00
Quality Control Summary			$0.00
Setup charge for ICP, total			$27.00
Sample Preparation			
Air Dry at 34 Degrees C	USDA No. 1, 1972		$10.50
Digestion - Hot Plate	M3050B ICP		$22.50
Saturated Paste Extraction	USDA No. 60 (2)		$24.00
Sieve-2000 um (2.0mm)	ASA No.9, 15-4.2.2		$16.50
Soil Analysis			
pH, Saturated Paste	USDA No. 60 (21A)	0.1 units	$10.50
Solids, Percent	CLPSOW390, PART F, D-98	0.1 %	$10.50
		Cost/Sample:	**$135.00**

This quote is based on a 10 working dayt rush Turn Around Time Soil preparation charges may fluctuate dependant on the condition of samples upon receipt. Please note that method detection limits are estimates and may be elevated depending on sample matrix.

ACZ Laboratories, Inc.
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Analytical Quote

Pam Pinson
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

9/21/2010

Quote Number: CU-SOIL

Pricing includes shipment of all standard sample containers and related paperwork by UPS Ground Service. Please allow three to five days for delivery when ordering containers. ACZ must be notified prior to receiving samples of all special requests such as electronic data deliverables or special reporting reqirements. The client will be charged for special sample containers or express shipping and additional charges may apply for non-standard requests.

This quotation is valid for six months from the bid date unless specified otherwise in the bid. All bids must be signed and returned to ACZ before project(s) is received. The authorized signature represents acceptance of the pricing as well as the general terms and conditions of ACZ Laboratories, Inc. Our general terms and conditions can be downloaded from our web site at http://www.acz.com/PDF/termsconditions.pdf. Please note that MDL's in this quote may possibly increase due to sample matrix or samples with high TDS.

All orders that require shipping of coolers are subject to a minimum charge of $200.00. Local orders without shipping are subject to a minimum charge of $125.00. Samples may incur a $10.00/sample disposal fee for any samples deemed to be hazardous.

ACZ Representative (Authorized signature and date) _____

Client Representative (Authorized signature and date) _____

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Analytical Report

October 01, 2010

Report to:
Pam Pinson
Freeport-McMoRan - Chino Mines Company
PO Box 10
Bayard, NM 88023

Bill to:
Accounts Payable
Freeport-McMoRan - Chino Mines Company
P.O. Box 13308
Phoenix, AZ 85002-3308

cc: Anne Thatcher

Project ID: ZN01CC
ACZ Project ID: L84417

Pam Pinson:

Enclosed are the analytical results for sample(s) submitted to ACZ Laboratories, Inc. (ACZ) on September 20, 2010. This project has been assigned to ACZ's project number, L84417. Please reference this number in all future inquiries.

All analyses were performed according to ACZ's Quality Assurance Plan. The enclosed results relate only to the samples received under L84417. Each section of this report has been reviewed and approved by the appropriate Laboratory Supervisor, or a qualified substitute.

Except as noted, the test results for the methods and parameters listed on ACZ's current NELAC certificate letter (#ACZ) meet all requirements of NELAC.

This report shall be used or copied only in its entirety. ACZ is not responsible for the consequences arising from the use of a partial report.

All samples and sub-samples associated with this project will be disposed of after November 01, 2010. If the samples are determined to be hazardous, additional charges apply for disposal (typically less than $10/sample). If you would like the samples to be held longer than ACZ's stated policy or to be returned, please contact your Project Manager or Customer Service Representative for further details and associated costs. ACZ retains analytical reports for five years.

If you have any questions or other needs, please contact your Project Manager.

S. Habermehl

Scott Habermehl has reviewed
and approved this report.

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Analytical Results

Freeport-McMoRan - Chino Mines Company
Project ID: ZN01CC
Sample ID: STS-IN-2010-111

ACZ Sample ID: ***L84417-01***
Date Sampled: *09/16/10 14:00*
Date Received: *09/20/10*
Sample Matrix: *Surface Water*

Inorganic Prep

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Total Hot Plate Digestion	M200.2 ICP							09/28/10 19:14	ear

Metals Analysis

Parameter	EPA Method	Result	Qual	XQ	Units	MDL	PQL	Date	Analyst
Copper, total	M200.7 ICP		U		mg/L	0.01	0.05	09/29/10 16:38	ear

Report Header Explanations

Batch	A distinct set of samples analyzed at a specific time
Found	Value of the QC Type of interest
Limit	Upper limit for RPD, in %.
Lower	Lower Recovery Limit, in % (except for LCSS, mg/Kg)
MDL	Method Detection Limit. Same as Minimum Reporting Limit. Allows for instrument and annual fluctuations.
PCN/SCN	A number assigned to reagents/standards to trace to the manufacturer's certificate of analysis
PQL	Practical Quantitation Limit, typically 5 times the MDL.
QC	True Value of the Control Sample or the amount added to the Spike
Rec	Amount of the true value or spike added recovered, in % (except for LCSS, mg/Kg)
RPD	Relative Percent Difference, calculation used for Duplicate QC Types
Upper	Upper Recovery Limit, in % (except for LCSS, mg/Kg)
Sample	Value of the Sample of interest

QC Sample Types

AS	Analytical Spike (Post Digestion)	LCSWD	Laboratory Control Sample - Water Duplicate
ASD	Analytical Spike (Post Digestion) Duplicate	LFB	Laboratory Fortified Blank
CCB	Continuing Calibration Blank	LFM	Laboratory Fortified Matrix
CCV	Continuing Calibration Verification standard	LFMD	Laboratory Fortified Matrix Duplicate
DUP	Sample Duplicate	LRB	Laboratory Reagent Blank
ICB	Initial Calibration Blank	MS	Matrix Spike
ICV	Initial Calibration Verification standard	MSD	Matrix Spike Duplicate
ICSAB	Inter-element Correction Standard - A plus B solutions	PBS	Prep Blank - Soil
LCSS	Laboratory Control Sample - Soil	PBW	Prep Blank - Water
LCSSD	Laboratory Control Sample - Soil Duplicate	PQV	Practical Quantitation Verification standard
LCSW	Laboratory Control Sample - Water	SDL	Serial Dilution

QC Sample Type Explanations

Blanks	Verifies that there is no or minimal contamination in the prep method or calibration procedure.
Control Samples	Verifies the accuracy of the method, including the prep procedure.
Duplicates	Verifies the precision of the instrument and/or method.
Spikes/Fortified Matrix	Determines sample matrix interferences, if any.
Standard	Verifies the validity of the calibration.

ACZ Qualifiers (Qual)

B	Analyte concentration detected at a value between MDL and PQL. The associated value is an estimated quantity.
H	Analysis exceeded method hold time. pH is a field test with an immediate hold time.
U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

Method References

(1)	EPA 600/4-83-020. Methods for Chemical Analysis of Water and Wastes, March 1983.
(2)	EPA 600/R-93-100. Methods for the Determination of Inorganic Substances in Environmental Samples, August 1993.
(3)	EPA 600/R-94-111. Methods for the Determination of Metals in Environmental Samples - Supplement I, May 1994.
(5)	EPA SW-846. Test Methods for Evaluating Solid Waste, Third Edition with Update III, December 1996.
(6)	Standard Methods for the Examination of Water and Wastewater, 19th edition, 1995 & 20th edition (1998).

Comments

(1)	QC results calculated from raw data. Results may vary slightly if the rounded values are used in the calculations.
(2)	Soil, Sludge, and Plant matrices for Inorganic analyses are reported on a dry weight basis.
(3)	Animal matrices for Inorganic analyses are reported on an "as received" basis.
(4)	An asterisk in the "XQ" column indicates there is an extended qualifier and/or certification qualifier associated with the result.

For a complete list of ACZ's Extended Qualifiers, please click: http://www.acz.com/public/extquallist.pdf

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic QC Summary

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84417***

Project ID: ZN01CC

Copper, total M200.7 ICP

ACZ ID	Type	Analyzed	PCN/SCN	QC	Sample	Found	Units	Rec	Lower	Upper	RPD	Limit	Qual
WG290578													
WG290578ICV	ICV	09/29/10 15:54	II100817-3	2		1.98	mg/L	99	95	105			
WG290578ICB	ICB	09/29/10 15:58				U	mg/L		-0.03	0.03			
WG290516LRB	LRB	09/29/10 16:10				U	mg/L		-0.022	0.022			
WG290516LFB	LFB	09/29/10 16:14	II100924-2	.5		.509	mg/L	101.8	85	115			
L84330-04LFM	LFM	09/29/10 16:26	II100924-2	.5	U	.52	mg/L	104	70	130			
L84330-04LFMD	LFMD	09/29/10 16:29	II100924-2	.5	U	.527	mg/L	105.4	70	130	1.34	20	

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Inorganic Extended Qualifier Report

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84417***

ACZ ID	WORKNUM	PARAMETER	METHOD	QUAL	DESCRIPTION

No extended qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Certification Qualifiers

Freeport-McMoRan - Chino Mines Company ACZ Project ID: ***L84417***

No certification qualifiers associated with this analysis

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
B0063543.0000

ACZ Project ID: L84417
Date Received: 09/20/2010 10:59
Received By: gac
Date Printed: 9/20/2010

Receipt Verification

	YES	NO	NA
1) Does this project require special handling procedures such as CLP protocol?			X
2) Are the custody seals on the cooler intact?			X
3) Are the custody seals on the sample containers intact?			X
4) Is there a Chain of Custody or other directive shipping papers present?	X		
5) Is the Chain of Custody complete?	X		
6) Is the Chain of Custody in agreement with the samples received?	X		
7) Is there enough sample for all requested analyses?	X		
8) Are all samples within holding times for requested analyses?	X		
9) Were all sample containers received intact?	X		
10) Are the temperature blanks present?			X
11) Are the trip blanks (VOA and/or Cyanide) present?			X
12) Are samples requiring no headspace, headspace free?			X
13) Do the samples that require a Foreign Soils Permit have one?			X

Exceptions: If you answered no to any of the above questions, please describe

N/A

Contact (For any discrepancies, the client must be contacted)

N/A

Shipping Containers

Cooler Id		Temp (°C)	Rad (µR/hr)
NA11643		7.1	18

Client must contact ACZ Project Manager if analysis should not proceed for samples received outside of thermal preservation acceptance criteria.

Notes

ACZ Laboratories, Inc.
2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

Sample Receipt

Freeport-McMoRan - Chino Mines Company
B0063543.0000

ACZ Project ID: L84417
Date Received: 09/20/2010 10:59
Received By: gac
Date Printed: 9/20/2010

Sample Container Preservation

SAMPLE	CLIENT ID	R < 2	G < 2	BK < 2	Y< 2	YG< 2	B< 2	O < 2	T >12	N/A	RAD	ID
L84417-01	STS-IN-2010-111	Y										☐

Sample Container Preservation Legend

Abbreviation	Description	Container Type	Preservative/Limits
R	Raw/Nitric	RED	pH must be < 2
B	Filtered/Sulfuric	BLUE	pH must be < 2
BK	Filtered/Nitric	BLACK	pH must be < 2
G	Filtered/Nitric	GREEN	pH must be < 2
O	Raw/Sulfuric	ORANGE	pH must be < 2
P	Raw/NaOH	PURPLE	pH must be > 12 *
T	Raw/NaOH Zinc Acetate	TAN	pH must be > 12
Y	Raw/Sulfuric	YELLOW	pH must be < 2
YG	Raw/Sulfuric	YELLOW GLASS	pH must be < 2
N/A	No preservative needed	Not applicable	
RAD	Gamma/Beta dose rate	Not applicable	must be < 250 µR/hr

* pH check performed by analyst prior to sample preparation

Sample IDs Reviewed By: gac

ACZ Laboratories, Inc. L8447

2773 Downhill Drive Steamboat Springs, CO 80487 (800) 334-5493

CHAIN of CUSTODY

Report to

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

Copy of Report to:

Name: Anne Thatcher	E-mail: Anne.Thatcher@arcadis-us.com
Company: ARCADIS	Telephone: 303-231-9115 e. 117

Invoice to

Name: Pam Pinson	Address: P.O. Box 10
Company: Chino Mines Company	Bayard, NM 88023
E-mail: Pamela_Pinson@FMI.com	Telephone: 575-912-5213

If sample(s) received past holding time (HT), or if insufficient HT remains to complete analysis before expiration, shall ACZ proceed with requested short HT analyses? YES [x] NO [ ]

If "NO" then ACZ will contact client for further instruction. If neither "YES" nor "NO" is indicated, ACZ will proceed with the requested analyses, even if HT is expired, and data will be qualified.

Are samples for CO DW Compliance Monitoring? YES [ ] NO [x]

If yes, please include state forms. Results will be reported to PQL.

PROJECT INFORMATION

Quote #:

Project/PO #:

Reporting state for compliance testing:

Sampler's Name: Carolyn Meyer

Are any samples NRC licensable material? Yes No

ANALYSES REQUESTED (attach list or use quote number)

SAMPLE IDENTIFICATION	DATE/TIME	Matrix	# of Containers	Total Copper							
STS-IN-2010-111	9/16/2010 2:00pm	SS	1	x							

Matrix: SW (Surface Water) · GW (Ground Water) · WW (Waste Water) · DW (Drinking Water) · SL (Sludge) · SO (Soil) · OL (Oil) · Other (Specify)

REMARKS

ARCADIS project ID: B0063543.0000

Please refer to ACZ's terms & conditions located on the reverse side of this COC.

RELINQUISHED BY:	DATE: TIME	RECEIVED BY:	DATE: TIME
Pam Pinson	9-16-10		
			9/20/10 10:50

FRMAD050.01.15.09 White - Return with sample. Yellow - Retain for your records.

Appendix C

The Use of Ashing to Correct for Soil Content

The Use of Ashing to Correct for Soil Content in Tissues

Many studies have attempted to correct for soil contamination in biota samples. In an issue paper on metal bioaccumulation use in risk assessments, USEPA (2004) identified the need to use soil-free plant data (the suggested method was washing) to determine BAF, "because the washed portion can better reflect the BAF, while the unwashed portion may better represent the total exposure for consumers." Unlike plants, insects can contain ingested soil internally, which is not removed by washing. Depuration of benthic organisms in tests used to determine metal bioaccumulation has been a standard approach for decades to remove internal soil, although depuration may not be entirely effective (Dawson et al. 2003). Washing techniques done to determine nutrient contents of plant roots have been shown to be largely ineffective (Hunt et al. 1999), and several alternative methods (including ashing) as well as models have been proposed to account for the soil contribution to total measured mass ingested (e.g., Hansson and Steen 1984, Pettersson et al 1986, Hunt et al. 1999). Such methods have been used to separate soil contamination from invertebrates. For example, Stafford and McGrath (1986) measured the acid insoluble residue (AIR) fraction associated with earthworm samples to determine the contribution of gut soil to metal concentrations in sample groups of "whole" (rinsed but otherwise unaltered), starved, and dissected worms. The AIR fraction was measured by ashing the samples and subsequently digesting the ash in a 6N HCl solution.

There is presently no regulatory guidance describing how to correct for soil associated with terrestrial invertebrate samples. In the current study, the insect samples were ashed, and the weight of the ash was assumed to equal the weight of the soil in/on the insects. In the literature, invertebrates are frequently ashed and subsequently the ash is digested using a strong acid. Not digesting the ash in acid could have resulted in an overestimate of the amount of soil, because the ash content of the insects was not subtracted from the total amount of ash. However, digesting the ash in acid will also result in an underestimate in the amount of soil if acid-soluble minerals such as calcium carbonate are abundant in the soil and are dissolved during the acid wash.

The rationale for digesting the ash in a strong acid (e.g., 6N HCl) is that it is assumed that the acid removes the non-soil content of the ash and the remaining ash purely represents soil. However, that assumption could be incorrect for two reasons. First, the digestion procedure does not tend to remove all non-soil ash content (Stafford and McGrath 1986). Second, after correctly adding back the volatizable organic material from the soil to the ash weight, some of the remaining mineral soil may be digested when acid is added, such as calcium carbonates. This unquantified component of soil is lost from the ash and needs to be added back to the ash after acid-washing if the ash is to represent soil.

The error of not acid-washing is about a 20% overestimate of soil amounts adhered to or in the insect for sites without much calcium carbonate in the soil. The 20% estimate is based upon the ash content of Chino insects averaging 6% and an estimate of 1.2% acid-insoluble ash, given that the acid-insoluble ash contents of most earthworm samples dissected and rinsed of soil averaged 1% (Stafford and McGrath 1986) and the additional ash content of chitin, the dominant component of arthropod exoskeletons, is <0.2% (Aranaz et al. 2009) (1.2%/6%). The 1.2% may be an underestimate because Uvarov (1931) found washed (with water and alcohol) museum locusts without the digestive tract had a 3-4% ash content (of which 11% was silica and 32% was phosphate). But 3-4% is an overestimate

because Uvarov's washing method does not remove all adhered soil, locusts are hairy insects compared to other insects (hair has high silica), and not all tissue-derived ash is removed by acid washing; thus 1.2% may be appropriate. Beyer et al. (1994) also suggests <2% is an appropriate estimate of acid-insoluble ash of soil-free diets of animals.

Some soils such as those in sites 8, 11, 12, 14 and 15 have high concentrations of calcium carbonate in the soil (>50 mg/L $CaCO_3$ in soil leachate). Sites 14 and 15 have >60,000 mg/kg calcium, site 12 has >40,000 mg/kg of calcium, site 11 has > 20,000 mg/kg calcium, and site 8 has >5,000 mg/kg calcium (Newfields 2005). Except for site 8 (occurs in soil with wind-blown tailings), these soils occur in soil types (Plack gravelly loam) having up to 7-40% calcium carbonate (NRCS soil data). For these sites, assuming 6N HCl dissolves all calcium carbonate, up to 7 to 40% of the soil adhered or in the gut could be missing (underestimated) from the ash if it had been acid-digested. The 12 other sites have soils with negligible amounts of calcium carbonate (<6 mg/L $CaCO_3$ in soil leachate), so acid washing to avoid overestimating soil on the insect and thus underestimating Cu in the tissue (too much high-Cu soil removed from the tissue estimate) might have been acceptable.

Moreover, the 3050B EPA method used to digest insect tissues and soil to obtain copper concentrations uses stronger acids (and peroxide) than the 6N HCl acid washing often used for ash. Ash from biota samples typically contains calcium carbonates, calcium phosphates and silica salts (USEPA 1993). Of these, silica salts are not completely digested following EPA 3050B; and in fact, a hydrofluoric acid digestion method is sometimes preferred in order to digest the more recalcitrant fractions. Thus, copper bound in silicate structures is excluded from the estimate of total Cu in the insect + soil sample, further underestimating copper in the insect tissue at most of the sites.

One approach to validating the results from this study is to correct the ash estimates for the soils to a value that removes the expected percentage of ash contributed by tissue and corrects for the silica omission of the 3050B method (no calcium carbonate correction is needed because the soils were not acid washed). If one assumes 1.2% of ash is from insect tissue and that 11.9% of the ash is silica (Uvarov 1931), and the concentration of Cu in silica is the same as in other matrices in the insect and not dissolved by the 3050B method, Cu concentration in the insect tissue alone can be approximated (Table C-1). The BAF equation using the adjusted tissue concentration is $\ln(BAF) = 5.1459 - 1.0968 \ln(Cu_{soil})$ ($r^2 = 0.6596$), and the RAC changes from 8,609 to 7,261 mg/kg Cu (using 100% bioavailability of insects), which is closer to the RAC value for washed insects. If 73% bioavailability of the tissue is used rather than 100%, given that the ash derived from tissue (silicates, calcium phosphates) is added back to the tissue with this method but is probably not bioavailable, the RAC is 8480 mg/kg Cu. These results suggest the RAC still is in the range of 6,000 to 8,000 mg/kg Cu for an omnivorous bird, whether or not the method used is washing only, ashing only, or ashing followed by acid digestion.

Table C-1. Revised insect tissue copper calculations and estimate after adjusting for tissue-derived ash and lab omission of silicates.

Location	Sample ID	2010 Insect Cu (mg/kg dry washed)	2010 Soil Cu (mg/kg dry wt)	% Ash content of insect samples	% TVS in soil	2010 Insect Cu (mg/kg AFDW) corrected for tissue-derived ash[1]	2010 BAF (AFDW corrected for tissue-derived ash)	2010 BAF (AFDW uncorrected for tissue-derived ash)
2	STS-IN-2010-002	176	915	5	4.8	143	0.16	0.14
3	STS-IN-2010-003	111	664	8	4.3	71	0.11	0.09
4	STS-IN-2010-004	92	525	10	3.3	48	0.09	0.08
5	STS-IN-2010-005	74	247	9	3.5	59	0.24	0.23
6	STS-IN-2010-006	163	650	9	3.3	123	0.19	0.18
7	STS-IN-2010-007	68	803	7	3.8	22	0.03	0.01
8	STS-IN-2010-008	162	661	8	3.3	126	0.19	0.18
9	STS-IN-2010-009	155	314	5	4.6	148	0.47	0.46
10	STS-IN-2010-010	100	209	6	4.8	95	0.46	0.45
11	STS-IN-2010-011	95	290	6	5.8	85	0.29	0.28
12	STS-IN-2010-012	127	224	6	5.1	122	0.55	0.54
13	STS-IN-2010-013	116	193	4	5.2	114	0.59	0.58
14	STS-IN-2010-014	87	138	3	6.3	87	0.63	0.62
15	STS-IN-2010-015	318	554	6	6.3	308	0.56	0.55
16	STS-IN-2010-016	102	1211	6	5.0	45	0.04	0.02
18	STS-IN-2010-018	137	1162	5	5.3	91	0.08	0.07

[1]Assume 11.9% of ash is silica and 1.2% of ash is from insect tissue,

where $Cu_{insect\_final} = \frac{(Cu_{sample}/(1 - 0.119*ash\%/100) - Cu_{soil}*(ash\%/100 - 0.012)/(1 - 0.012 - tvs\%_{soil}/100))}{(1 - (ash\%/100-0.012)/(1 - 0.012 - tvs\%_{soil}/100))}$

and Cu_{sample} is the composite Cu concentration in the insects plus soil in the "insect" sample.